The Iron Age

A Review of the Hardware and Metal Trades.

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The Works of Sir John Cockerill & Co. at Liege, Belgium.

The largest iron works in Belgium are those of Sir John Cockerill & Co., which are situated at Liege, on the site of what was formerly the Bishop's Palace. These works have a curious history. An annual sum of 1,000,000 florins was placed at the disposal of the King in 1822, for the encouragement of industry by premiums, loans, and other means. His Majesty, wishing to improve the method of smelting and manufacturing iron, invited Mr. Cockerill to settle in the neighbourhood of Liege, and gave him a large sum by way of loan in order to assist him in the extension of his works. A condition was also imposed upon Mr. Cockerill that the ironmasters of Liege and Namur should have liberty to visit the works in order that they might acquaint themselves with the true principles of the art of metallurgy. The works thus established have been extended from time to time until they are now of vast size. Situated on the banks of the Meuse —a slow river and very suitable for the purposes of navigation —they cover altogether 90 hectares or 180 acres. One-eight of this enormous site is entirely covered by buildings. They employ over 7000 operatives, inclusive of the mines and the auxiliary works of Antwerp and St. Petersburg. They can produce annually 50 locomotives of the largest size, 70 to 80 marine engines of 4 to 1000 horse-power, 1500 lots of mechanical construction, 3,000,000 kilogrammes of bridges and like structures, 14 ships and boats requiring 5000 tons of material, beside an annual production of 7,500,000 kilogrammes of wrought and cast steel, steel rails, tires in steel and iron, and steel casting for machinery; 10,000,000 kilos. of plates and sheets, merchant iron, and specialties; and 25,000,000 kilos. of rails. The works of Palmer's Iron Shipbuilding Company, at Jarrow, are the only establishment in England that can fairly be compared with the works of Searing. Both of these works, indeed, are so identical that the one might also have been modelled on the other. Both raise their own minerals; both carry on the manufacture of iron through all its intermediate stages, until it takes the form of ships, bridges, and other structures; and both are the largest of their kind in the respective countries to which they belong. I have a dim recollection of Mr. Charles Mark Palmer taking credit to himself and to his workmen, several years ago, for the expedition with which they had turned out vessels required for some great emergency. I believe that one man of war, designedto operate against Cronstadt during the Russian war, was turned out in three and a half months. Those of your readers who have a more perfect recollection of the event may be interested in comparing it with the smartest thing ever achieved in the same way by Sir John Cockerill & Co. It was on the 18th of June, 1863, that two armor-plated monitors, with towers, propellers, and machines for towers, ventilators, gun carriages, centrifugal pumps, and accessories were ordered of the Seraing firm by the Russian Government; on the 24th of October, 1863, the monitors were sent to St. Petersburg to be finished, and on the 13th June, 1864, they were booked to the Imperial authorities, fully equipped and armed, having thus been commenced and completed within twelve months. It is not my business to go into a full description of these gigantic works, which are, on the whole, pretty similar to other factories of the same kind in England; but I cannot help adding that they are in themselves sufficient to raise Belgium to the rank of a great iron-producing country, and they will favorably compare with the great Essen works of Prussia, the Creuzot works of France, the Cambria works of Johnstown, U. S., or the many gigantic establishments that fabricate iron and steel in our own country. I have selected the Seraing Iron works as an example and the best type of Continental iron-making establishments. *Ab uno disce omnes.* There are numerous other large iron works between Brussels and Liege, and on the banks of the Meuse; but none of them will bear comparison for size with those of Seraing, nor have any of them such a deeply interesting history. The average hight of the Belgian blast furnaces is from forty to fifty feet, or about the same size as the Staffordshire and Welsh furnaces. Their production does not exceed fifty to fifty-five tons each per twenty-four hours. This is about 200 tons per week less than the average of the Cleveland blast furnaces, and as there is little difference in the cost of the labor employed, there is a very manifest advantage in favor of the North of England. It is in the economy of the raw materials used in the blast furnace that the Belgians excel the English iron makers. As a general thing, no more than 115 tons of coke are used to smelt 100 tons of iron in Belgium; whereas in Wales, Staffordshire and Scotland, the consumption of coal is much greater. So far as the North of England is concerned, I believe that the consumption of coke per ton of iron made will not be more than the Belgian average, and in some cases—as, for example, Ferryhill, where they make a ton of pig with 18 cwts. of coke—it is rather less. But this economy on the part of the iron makers of Belgium becomes all the more notable when it is considered that the richest ores used in that country do not contain more than 35 to 37 per cent. of iron, while there is a large quantity used that contains no more than 26 or 27 per cent.—a percentage which, even in the North of England where the very poorest ores are found, would hardly be considered worth the trouble and cost of reduction. Beside this, the ores of Belgium are, as a rule, extremely hard and intractable, and they have not the same opportunity for absorbing oxygen that belongs to some of our English ores that are found near the surface of the earth. It is, in iron-making, an almost axiomatic proposition that, *cæteris paribus*, 25 per cent. more fuel is required to reduce an ore yielding only 30 per cent. of iron than an ore would need that contained 40 per cent.; and considering the above facts, it is probable that Mr. Samuel Plimsoll, the member for Derby, was not far wrong when he declared, after a close comparison of English and Belgian metallurgy, that "Belgian ironmasters get, on a very moderate calculation, more than double the work out of a ton of raw fuel than we do." The question is thus naturally suggested, What sources of economy known and practiced in Belgium have yet to be learned in England? Each member of the Institute will be afforded ample opportunities for answering this question for himself; but I may remark that the Belgian mode of treating the raw materials before charging them in the furnace appears to be superior to the English. The coke, ironstone, and lime are reduced to small lumps, about the size of a moderate potato, and after being thus suitably broken, they are mixed together in given proportions, instead of being rudely and carelessly thrown into the furnace in separate barrowsful, as the practice is in England. The men whose duty it is to charge the furnace are exceedingly careful to preserve a uniform mixture in the distribution of the materials entering the furnace; and to assist its friability a jet of water is occasionally allowed to play upon the ironstone before being used. It is the custom also in Belgium to collect the waste gases of the furnace by a bell, and afterward utilize them in heating the blast and the boilers that raise steam. Another cause enabling the Belgian producer to take up an advantageous position in the English market is the cheapness of transit by rail, which is fully one-half less, taking it all round, than the same charges in England. This superiority is due to the fact that the legislature of Belgium has done a great deal to stimulate the development of railway enterprise. Belgium was the first European state that undertook the construction of railways at the public expense, and at the present time there are close on four hundred miles of state railways laid down at a cost of nearly five and a half millions sterling! It occurs to me, however, that Belgium would prove a far more powerful rival to England than she now is if the improvements introduced into the Cleveland district within the last ten or twelve years were generally adopted. The coke used in Belgium is very analogous in composition and character to the coke used in the Cleveland furnaces; it is capable of resisting a great pressure in the furnace, and there does not seem any good reason why the Belgian iron master should not carry his blast furnace to the height of eighty or ninety feet with advantages equally as great as those that have accrued to the North of England. It is probable that this and collateral matters will suggest themselves to and be discussed by the Institute in the course of the week.—*Correspondence of the Newcastle Chronicle.*

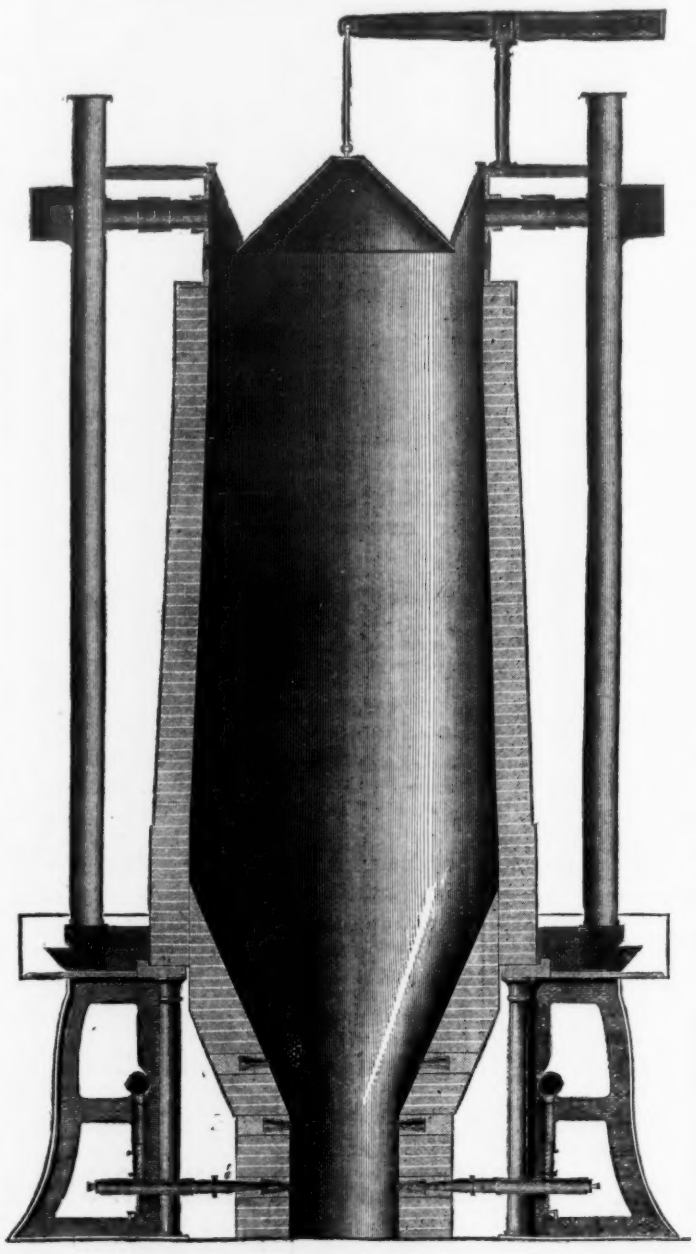

Fig. 1.

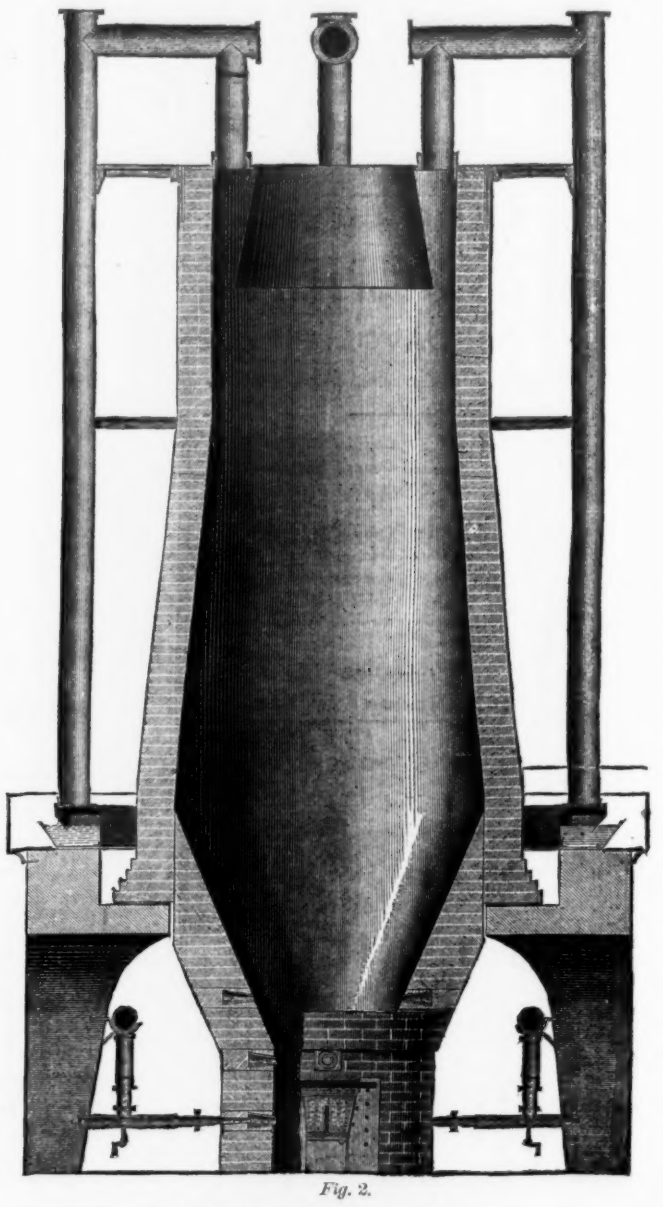

Fig. 2.

BUTTGENBACH'S SYSTEM OF BLAST FURNACE CONSTRUCTION.—[*For description, see page 5.*]

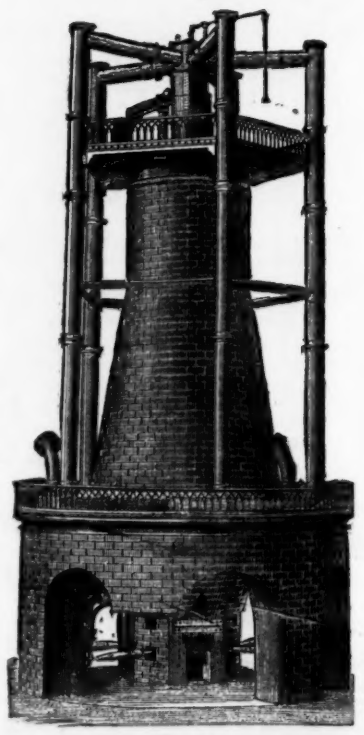

Fig. 3.

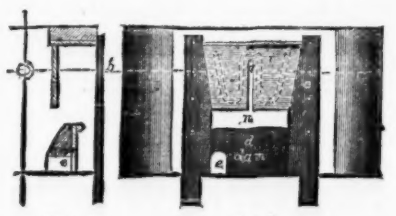

Fig. 4. *Fig. 5.*

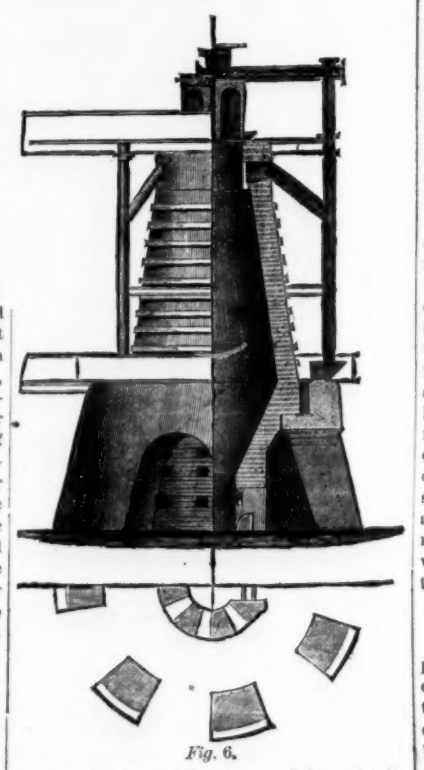

Fig. 6.

Iron and Coal in Burmah.—In a paper, published under the authority of the government at India, relative to the resources of Upper Burmah, as far as regards minerals, Captain G. A. Strover, Political Agent, Mandalay, has the following remarks: *Iron.*—Iron abounds in the Shan States, and the district of Pagan, to the south of Mandalay, is noted for it. A manufactory exists on a rough and ready scale in this district at Pohpah Toung, but the outturn is considerable. To the west of Sagaing, for miles up the Irrawaddy river, the ore abounds—a rich hematite. His Majesty is now procuring iron works from England, and will before long have a large foundry, with all the requisite machinery, erected and at work at Sagaing. The surface hematite alone will feed it for years to come, if worked. Two mining engineers are now awaiting the arrival of the works, and expect to proceed to Sagaing soon to commence operations. *Coal.*—This mineral is known to exist at Thingadaw, about 70 miles above Mandalay, on the western bank of the Irrawaddy; at Shuaygoo, below Bhamo; at Meimbaloung, in the Shan States, east of Mandalay; to the southwest of Mandalay in the Yah district, at Yaignaw, east of Nattaik. It is found at Pagan and Shimpagah, and it is probable that it exists near Meulah and Yeynangyoung. At Thingadaw thecoal has been extracted, but it is of an inferior description, and more resembles lignite than the true mineral coal. An attempt was lately made here to ascertain the productiveness of the coal beds. It is nearly certain that plenty of coal exists in the locality, and a few more borings would probably prove this. The coal bed in the Shan States, at Meimbaloung, contains the true mineral coal, and consequently a valuable coal. It has been inspected by an experienced mining engineer, and highly approved of as equal to the best English coal. There is little doubt that the beds are extensive, but unfortunately the distance inland is great, and no easy means are available for transporting the coal to the low lands; indeed, the only method at present is by floating it down mountain streams and rapids on rafts, which entails considerable risk and loss of coal. European skill and enterprise would soon make a safe route of one description or another if really required by the government; it remains at present, with neighboring wealth, where nature placed it, awaiting development in times to come.

It is said that the Pennsylvania Railroad Company will shortly discharge about one thousand employees along the line of their road, and that they have countermanded an order for fifty additional locomotives that were to have been built at once. The cause assigned for this is the depression in the coal trade, owing to the recent general strikes in this end of the State.

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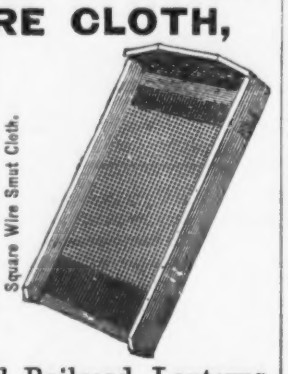

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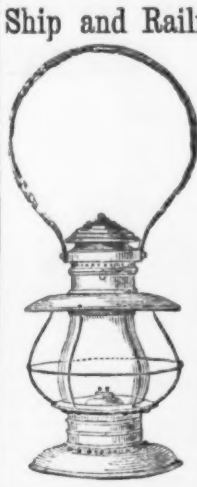

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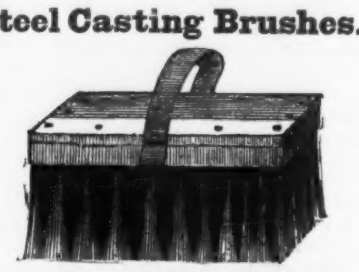

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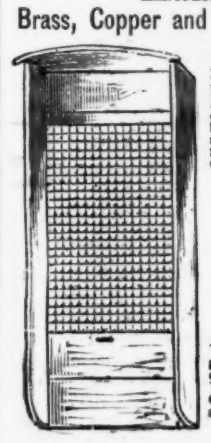

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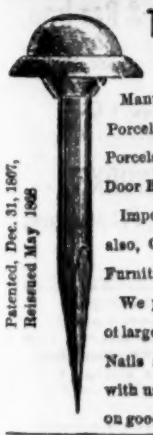

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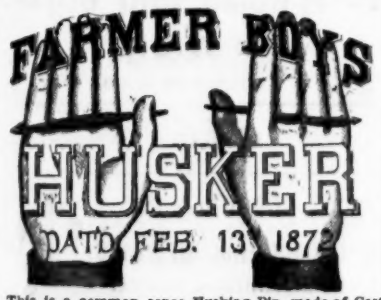

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New Patents.

We take from the records of the patent office at Washington the following specifications of certain patents lately issued, which will be found interesting:

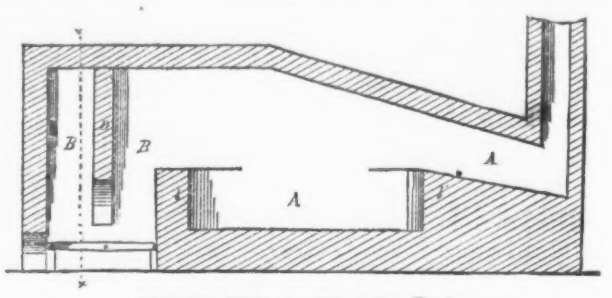
IMPROVEMENT IN PUDDLING FURNACES.

Specification forming part of Letters Patent No. 129,153, dated July 16, 1872; reissue No. 5500, to Hugh McDonald, of Pittsburgh, Pennsylvania.

Figure 1 is a longitudinal vertical section of an ordinary puddling or boiling furnace fitted with my improvement; and Fig. 2 is a transverse vertical section through *x x*, Fig. 1.

Like letters of reference indicate like parts in each.

One of the considerable items of expense incurred in the manufacture of iron by the process of boiling or puddling is that of fuel, since



IMPROVED PUDDLING FURNACE.—*Fig.* 1.

a large percentage of its heat producing properties escapes as smoke, unconsumed gases, etc. To remedy this smoke consuming furnaces have been devised, most of which are objectionable on account of cost, complication, or for other reasons.

By the improvement the ordinary fire chamber of a puddling, boiling, heating, or smelting furnace is adapted for use as a smoke burner, without materially lessening its capacity as a chamber for the combustion of fuel, whereby, at small cost, each such furnace may be converted to a smoke burner, with the desired result in saving of fuel and increase of effective heat.

In the drawing, B and B' represent the fire chamber of an ordinary puddling or boiling furnace; *a*, the grate bars; *b*, the fire bridge; A, the working chamber; *b'*, the flue bridge; and A', the neck. Transversely across the fire chamber B B', from one side wall to the other, I build a partition wall, D, which extends down from the top or cover till its lower edge is about even with or a little below the upper edge or surface of the fire bridge *b*, and still far enough above the grate bars *a* to leave room for working forward the fuel from the chamber B, to the chamber B'. Preferably its lower edge is of arch form, as shown, though it may be straight. This partition wall is at or not far from a point equidistant between the end wall and the fire bridge, *b*. The chamber B' is provided with a stop hole similar to that shown at *d*. In the construction of new furnaces, the space for the chambers B B' may be lengthened somewhat—say, a few inches, more or less—beyond the dimensions ordinarily adopted; but this is not essential.

The action of the heat on the metal in the chamber A, whether it be directly exposed to the heat, or inclosed in pots or crucibles, or covered by any materials with which it is to be

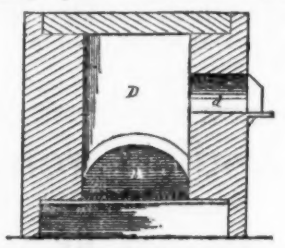


Fig. 2.

treated, is well known; and the advantages of coking certain kinds of fuel in one chamber and feeding it along into another, where it or the smoke and gases evolved from it are to be burned, need not here be set forth.

Thus, by the simple interposition of the wall, D, is secured for the ordinary puddling, boiling, heating or smelting furnace all the material advantages which are sought to be accomplished by the construction of elaborate and costly smoke burning contrivances.

Two or more walls, D, may be introduced, if so desired; but one is sufficient, in most cases, to secure a useful result.

In order that the chamber, B', may more perfectly perform its office, extend the grating *a* back under it, or arrange a separate grating thereunder, so that air may be admitted freely therein.

It will be observed that the partition wall, D, is of such form (having sides vertical, or nearly so) and such thickness relatively to the length of the fuel space or magazine that, while increasing the efficiency, it does not materially lessen the magazine capacity of the chambers, B B', for the reception and combustion of fuel, which feature is an important one, particularly in connection with the use of soft or bituminous coal as fuel.

Claim—In combination with the working chamber of a puddling, boiling, heating, or smelting furnace, a partition wall, D, extending transversely across the fire chamber or magazine, so as to divide the same into coking and combustion chambers B B', and at the same time retain, substantially, its magazine capacity for the reception and combustion of fuel.

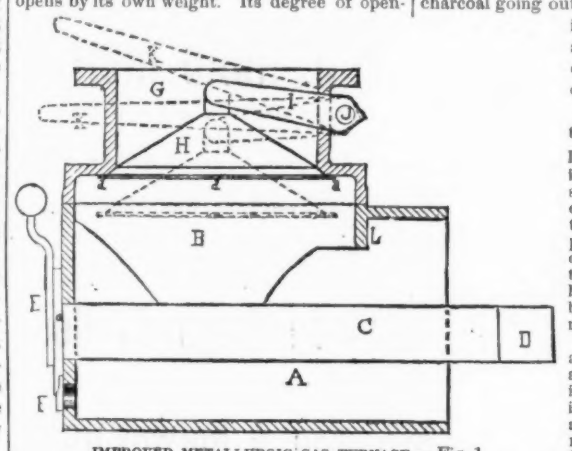
IMPROVEMENT IN METALLURGIC GAS FURNACES.

Specification forming part of Letters Patent No. 141,002, dated July 22, 1873, issued to John M. Hartman, of Philadelphia, Penn.

The object of this invention is the economical burning of furnace gases by their intimate mixture with air, either heated or cold, in contact with or in the presence of heated brick work or other fire-proof material. When heated air is employed it is caught by pipes located in the discharge opening of a hot blast oven, boiler setting, puddling, heating, or other furnace, and returned to mix with the gas.

Figure 1 is a sectional view of the valve chamber, air pipe chamber, and gas passage. Fig. 2 is a reduced side elevation, partly sectioned, of the valve chamber, air pipe, and gas chamber, brick work and boiler setting.

A is a case or pipe holder and gas chamber, and B is a connection or opening to the interior of it. C, C are pipes placed lengthwise in the chamber A. Their outlet ends have fire-proof tips D, to protect them from the heat; or movable ends can be used, to be replaced when rendered worthless from the same cause. Their inlet ends have the flanges *a*, by which they are bolted to the outside of the case or chamber, so as to be easily withdrawn and replaced when burned or otherwise rendered inoperative. E, E are fly-valves at the inlet ends of the air pipes for regulating the quantity of air passing through them. F is a valve over the dust opening of the chamber. G is a valve chamber on the nozzle or connection B of the chamber A. They are bolted together at their flanges *b c*, to be easily separated when required. H is a conical blow shut valve in the chamber G. It is suspended from the end of the arm, I, of the shaft, J. Its lugs, or projections, *d*, prevent it from tilting, or cocking, when closing. K is a lever, or handle, on the end of the shaft, J. *e*, *e* are pin holes in the side of the chamber, G. The valve, H, opens by its own weight. Its degree of opening is evinced by the inclination of the lever. The pin, *f*, prevents the lever from dropping when the valve is in its adjusted position. The bearings of the shaft, J, are made perfectly true and tight to prevent the escape of gas. L, Fig. 1, is a fender, which depends from the upper part of the chamber, A. It protects the valve, H, from the heat of the burning gas in the front part of the chamber.



IMPROVED METALLURGIC GAS FURNACE.—*Fig.* 1.

Gas from the puddling, or other furnace, passes through the valve chamber, G, into the chamber, A, thence to its front, where it mixes with air (either heated or cold) issuing from the pipes, C, and combustion takes place. The air and gas impinge on the heated brick-work, M, in front of the pipes, whereby the combustion is increased and intensified. Before admitting gas to the chamber, A, the brick-work M, can be heated by any means, the easiest being to burn wood upon or against it.

The inventor's claim is not limited to brick-work of any particular construction; nor to a given material for constructing the bridge, M. Any fire-proof material will serve the purpose.

If there is not sufficient heat in the walls of the chamber, A, to ignite the gas when it is first admitted, an explosion usually occurs, which is not confined to the chamber. The gas in the flues becomes fired, and also explodes, causing great destruction. The slide-valve usually employed cannot be closed in time to prevent an explosion in the flues.

When an explosion occurs in a gas burner using the valve, H, it is immediately blown shut, and is held in place by the pressure in the chamber, A, until the gas is burned. The valve closing on its seat, shuts off all communication between the chamber and the flues, and thereby prevents the gas in the said flues from being fired.

The valve H, by its tapering or conical formation, throws off all dust and dirt which falls through the flues onto the surface of the valve, and which would impair its working if it was allowed to deposit.

The construction of the boiler N for generating steam, and the way of applying the flame to it, do not enter into the invention.

Claim 1. The gas chamber, A, in combination with the air pipes, C, and the breast or brick-work, M.

2. The gas-chamber, A, of a gas burner, in combination with the balance, or blow-shut valve, H.

3. The valve, H, constructed with a conical, or tapering, back, and a valve-seat bearing, or ring.

4. The chamber A and G, constructed separately, and bolted or otherwise secured together by their flanges *b*, *c*.

5. The valve H, arm I, shaft J, lever K, the openings *e*, and the pin *f*.

6. The depending fender L, in combination with the chamber A.

7. The chamber A, in combination with the pipes C.

8. The chamber A, pipes C, and the valves E.

9. The pipes C, in combination with the fire-proof tips D, all for the purpose shown and described.

IMPROVEMENT IN ALLOYS.

Specification forming part of Letters Patent No. 141,529, dated Aug. 5, 1873; issued to Howell W. Wright, of Glastenbury, Conn.

The metals of which the alloy is composed are copper and zinc. The proportion of copper is one-forth to one-third of the whole, by weight, and the zinc forms the remainder.

The zinc is first melted in a crucible or other proper receptacle, being mixed as it is melted with powdered charcoal or other equivalent carbonaceous matter, so as to cover the zinc and exclude it from the air. When the zinc is all melted the cover of the crucible is put on, and the whole mass raised to the melting point of copper, when the copper is added in thin sheets, the heat continued till the copper melts, when the melted mass is to be stirred thoroughly, so as to perfectly mix the two metals; and then the mass is cast into an ingot or block, the charcoal going out with the metal, thus excluding it from contact with the air. The carbon forms a black coating upon the ingot, which can be readily removed.

The color and quality of this alloy are improved by preparing the copper which is used as follows: Take, say, 100 pounds of common copper, melt it, and continue the heat until it bubbles. Now put in about two ounces of common soda ash, stir thoroughly, and continue the heat till the copper boils or bubbles in the center of the mass, then cast into sheets.

After the alloy of copper and zinc is cast into an ingot, as hereinbefore described, it is not to be disturbed till the ingot chills. This alloy melts at a little lower heat than common brass. When this alloy is mixed with Britannia metal it cheapens it, but improves it, making it whiter, harder, tougher, and more tenacious. When mixed with brass it cheapens it, but improves its color and quality. When mixed with German silver it cheapens it, but hardens it, and makes it tougher than even the admixture of copper. When mixed with pin metal it cheapens, but toughens and improves it. When mixed with bell metal it cheapens, but improves, giving it a finer ring and better color.

This alloy is probably capable of a similar use with many other metals.

When melted with any of the above-named metals it makes a finer and more fluid metal, giving a casting that is compact, sound, and free from pores.

The inventor claims to have found that the sudden plunging of the zinc into the melted copper has a tendency to burn the zinc and impair its quality; and, also, that it is almost impossible to prevent waste of the zinc from combustion when the zinc is plunged into the melted copper. By first melting the zinc, and then carrying it under a flux of carbonaceous matter to the melting-point of copper, the danger of its burning so as to impair its quality is avoided, also the waste from combustion. He further finds that the process carbonizes the zinc, and that the resulting compound with the copper has distinctively different features and qualities from a compound of even the same proportions produced after the old methods. The alloy is much whiter, harder, and finer in grain.

This process of alloying zinc is not, obviously, confined to effecting a union with copper, for the zinc can, either alone or after having the copper added, be carried to the melting point of metals which are still more infusible, as nickel and zinc, or of nickel, copper, and zinc.

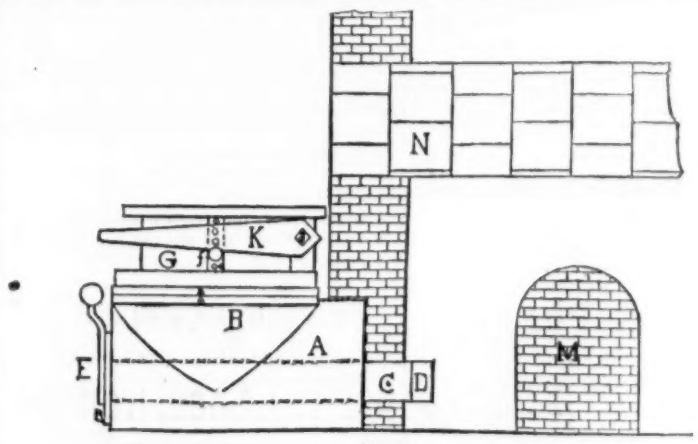


Fig 2.

Claim—The process of producing an alloy of zinc with copper, or other metal or metals which melt at a higher temperature than zinc, by first melting the zinc and then carrying it under a carbonaceous flux to the melting point of the more infusible metal or metals, and then adding such other metal or metals, the whole being done substantially in the manner and for the purpose described.

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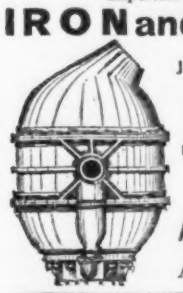
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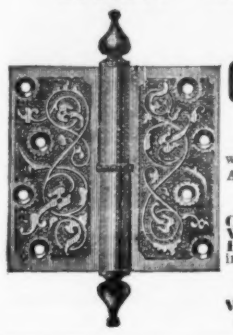

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Buttgenbach's System of Blast Furnace Construction.*

BY FRANZ BUTTGENBACH, OF NEUSS HUTTE, PRUSSIA.

In 1859, I undertook the management of the Neuss Smelting Works, situate on the Lower Rhine, Rhenish Province, and there I found a high blast furnace, then just recently erected, which had not yet been in active operation.

An engineer, late of the Liegen district, who had seen all the blast furnaces of that part of the country set up against steep hills, supplied with raw materials brought up to the required level by means of carts and wheelbarrows, and having steam boilers and air-heating apparatus mostly on a level with the furnace mouth, when charged with the duty of sketching out a plan for the works above mentioned, in his inability to free himself from the influence of this (old fashioned) notion, actually projected and caused to be built on a level plane, a stack of masonry measuring 40 ft. square at its base, by 40 ft. in hight, rising perpendicularly.

At the center of this stack was placed the blast furnace, its hearth being accessible only by means of very narrow embrasures; upon the platform of the furnace mouth two steam boilers have been erected, as well as a draught flue, the idea being, probably, that the descent was to take place contrary to the natural tendency of the gases.

This stack being altogether too bulky for me to attempt to remove it bodily, I simply contented myself with clearing away as much of it as possible round about the hearth, and in such condition as I then brought it to, our blast furnace has been continuously at work ever since 1860, under my management. The difficulty of working with a furnace similary blocked in, but more especially the fact resulting from the experiences of two or three years' operations that the fire-proof facings had completely worn away, impelled me to attempt the construction of a blast furnace, the hearth of which should be readily accessible on all sides, and following up this idea, I built up at our works a blast furnace 50 ft. high, and 17 ft. in diameter at the boshes.

In justice to my brother, a metallurgical engineer, I must not here omit to state that, in elaborating and finally determining upon my plans, I had the advantage of his suggestions and valuable advice. In 1867, a model of the above named blast furnace was exhibited in Paris, and I had the satisfaction, not only of being complimented upon my idea by a great number of engineers of every nationality, qualified to express an opinion on the subject, but of having conferred upon me, likewise, the distinction of an honorable mention on the part of the jury of the Exhibition. The articles contributed to the *Revue Industrielle* of the Exhibition of 1867, by Professor Jordan, who occupied the chair of metallurgy at the Ecole Centrale in Paris, have brought my system into notice in France. Since 1867 six French ironmasters have adopted my system, and have constructed nine blast furnaces from my plans and in accordance with my suggestions. Both in Germany and Austria my system has likewise been introduced with success at several ironworks.

The fundamental idea of this mode of construction, and the advantages of the system, may be summed up as follows, viz.: (1) The mason work of the stack is quite independent of the blast furnace proper. Each ring or course of bricks constituting the hearth, boshes, and inside wall, is readily accessible and free from any casing, except as regards a small portion, measuring from 3 ft. to 4 ft. in hight, at the widest section of the blast furnace. Consequently, the whole of the above several parts are completely bare and easily reached for any purpose required while the furnace is in active operation. This feature conduces to the duration of the furnace, for in case of need any injured part can be repaired, even when the furnace is at work. (2.) The inside wall and the upper part of the boshes being cooled by the atmosphere having access thereto, they remain in the normal condition without wear, and do not become unduly heated at any time, being therefore indefinitely kept in a state of preservation, since there nevers occurs a fusion of materials at this hight. (3.) The hearth and the lower portions of the boshes being apt to suffer after a certain time from the destructive action of the materials in a melting state, may be replaced without any difficulty whatever while the work is going on, so that there is no occasion to apprehend any extinction of the fires so long as the in-wall is not destroyed. If putting out the fires should at any time become necessary, the hearth and the boshes could be renewed without affecting the in-wall injuriously. (4.) Each particular brick being accessible during the working of the furnace, and the progress of the fire easily ascertained, corrosions can be obviated by cooling down with water thrown on the several parts, or by means of water vessels or tuyeres wherein the water circulates placed within these parts as far as the inside of the furnace, whereby the wear and tear can be checked. (5.) The utilization of the gas at the furnace mouth can be so managed as to make it yield the best results. The pillars supporting the platform of the furnace top are gaspipes, and drop into sheet iron vessels fixed to the summit of the base of the stack where it slopes away. These vessels are open on one side, so that when filled with water up to a certain hight, they can be shut down by means of a valve measuring a few centimetres square. The gas issuing forth out of the furnace mouth finds its way into these receptacles, and in its passage through them travels over a large surface of water. Here it deposits the dust, while a great part of the water suspended in the gas in a state of vapor is condensed. Consequently the gas reaches its destination in a highly purified condition, and may yield the very best results in those parts where it is desired to make use of it. The arrangement of the said water receptacles allows of the withdrawal of the dust or grit deposited while in full working, and in the event of an explosion the area of from five to six millimetres of the water column paralyzes, as though it were a gigantic valve, any injurious effects. In point of fact, instead of dreading, we rather wish for explosions from time to time, since they serve the purpose of clearing off the dust and grit that may still be clinging to the inner walls of the pipes. Moreover, there is the advantage of confining these subsidiary appliances to a spot on the works which does not in any way interfere with the general progress of the manufacture. (6.) The gas pipes being supporters also of the platform surrounding the furnace mouth or top, render the said platform independent of the blast furnace proper, and that without involving any special outlay.

In the first days of this erection, critics expressed a fear that the chilling of the parts thus exposed in this blast furnace would be achieved only at the cost of a greater consumption of fuel. But, contrary to such apprehensions, experience has amply shown that blast furnaces, the brickwork of which at the core is in direct contact with the outer air, use less fuel than do those that are protected by strong mason work, or shut in by means of a second inner casing with a lining of sheet iron; and the opinion expressed by me from the very beginning explains this result. For, in point of fact, a blast furnace should form at its lower part a smelting crucible, and it is generally known that every expedient available is brought into use for the purpose of cooling the walls of this portion of the structure. The boshes are a kind of retort wherein the ore is reduced by means of its contact with the fuel, and the in-wall is like unto the neck of a retort, and in which the ore is prepared by the action of a moderate heat and contact with the reducing gases.

If the ore sinking into the in-wall section acquires a spongy condition, and continues in this condition without undergoing semi-fusion, it is quite obvious that the effect produced by the gas must be infinitely greater, and that the ore must descend into the zones of the boshes and of the hearth in a much better state of preparation than if the heat of the in-wall had partially converted it into cinder, so that the reducing gas must pass on incapable of action upon such ore, except superficially. The ore, thus brought into a better state of preparation, must of necessity require less fuel in order to its perfect fusion. Moreover, in the event of cinder being formed at the in-wall zone it will adhere to the walls and produce concretions, which always impede the proper working of a blast furnace. When the ore sinks with regularity the smelting process is facilitated, whereby a further saving of fuel is effected.

The truth of the foregoing assertions has been fully established by the experience of eight years' working at our works. Concretions have never been noticed, and the proportion of fuel required for the furnace constructed upon the new principle has always been from 10 to 15 per cent. smaller, *cæteris paribus*. When good coke has been used excellent No. 1 foundry pigs have been produced from ores yielding 35 per cent., the consumption of coke being in the ratio of 11 parts to 10 parts of pig, at a temperature of 350° Centigrade, under blast, while in the case of white pig it is one part less of good coke to every part of pig. Touching the fears entertained of undue chilling in severe seasons, the following facts have served to dispel them *in toto:* The blast furnace at the Neuss Works has more than once been suddenly blown out for several weeks, owing to causes quite foreign to its working capabilities. Three of these suspensions occurred during the war in the year 1870–1871, owing to the want of fuel, and no preparatory arrangements were made before any of the said suspensions of work. They lasted during a space ranging between three and ten weeks respectively. I did not touch the blast furnace during any of the periods of stoppage referred to, the most prolonged of them occurring at a time when the thermometer registered 10 to 17° C., and yet when work was resumed the furnace did its work again with surprising regularity. On the last occasion, however, I was obliged to raise up the tuyeres, in consequence of the thickening of the bottom stone. For the last two years the furnace has been blown from one meter and fifty centimeters above the original level. It behaves admirably, producing as much as 50,000 kilos in twenty-four hours. I cannot conceive of any blast furnace constructed upon a different principle being capable of withstanding the effect of events such as those detailed above, and yet remaining fit for work. The blast furnace I am describing has entered upon the eighth year of its existence, and the condition of its core is such, as yet, that one will readily admit the almost certainty of its lasting out double or three times the said number of years, considering that the bricks of the in-wall and of the boshes have, up to the present, lost nothing of their thickness. This may be easily verified, for all the bricks coming to the outer air may be examined at any moment. Their thickness may be unerringly ascertained by piercing the walls with a small pin drill. The walls, be it borne in mind, are but weak, measuring no more than two feet thickness at the base and eighteen inches at the summit of the in-wall. This thickness they have not lost during an existence of eight years. Experience has shown, moreover, that the core of the furnace being exposed to the air, the internal heat produces hardly any effect upon the bricks, either by dilation or contraction. Hearth, boshes and in-wall were originally fastened together in the Neuss blast furnace by means of flat iron binders occurring at the third course alternately. This precautionary measure appears superfluous. It is over four years ago since I had the binders removed at the hearth and boshes, as well as at the in-wall, in part, for I perceived that they served no useful purpose, since the cooling down of the bricks prevents expansion altogether. Indeed, the furnace in the parts referred to is just the same as on the day of its erection.

At Vienna, I have exhibited at the *Deutscher Pavillon fur Bergbau, Huttenwesen*, a model of this blast furnace (Fig. 3), in which I have shown the deductions made from an experience of the working during a period of eight years, of the first blast furnace of its kind. The chief alterations introduced by way of improvement consists in a diminution of the stack, to a very great extent, at that part of it which supports the in-wall; this diminution being accompanied, however, by so considerable a sloping away from the center toward the rise of the boshes, that the space around the hearth and the boshes has been still further enlarged, so that it may be considered as perfectly isolated. I have also introduced a peculiar description of closed hearth, which admits of ordinary working, as well as working with a closed hearth. I have been using this method for the last six years with the very best results. Its application is very simple indeed, and free from the objectionable features of other known methods, since the work of the bottom of the furnace can be performed in case of need without depending upon the mouth of a tuyere for running off the slag.

The hearth is closed in by a cast iron tymp placed in the usual position. This tymp arch is cooled by a current of water passing through a coiled iron pipe fixed in the cast iron. In the center of this plate there is an aperture or orifice measuring ¾ in. running almost over the entire hight, and the cooling pipes are situate as near this kind of slit as may be. This slit is closed up by means of ordinary clay. *a* (Fig. 5) the upper portion of the slit, is placed 2 in. or 3 in. higher than the center of the line of the tuyeres. *b*, level center of the tuyeres; *c*, columns of the breast; *d*, dam; *e*, tap-hole; *n*, space between dam-stone; tymp closed in with clay; T, cast iron tymp. The slag of the blast furnace ascending above the dam stone and reaching the level of the tuyeres, runs off easily through a hole driven by means of a light steel bar into the said slit; and since the level of this hole may be altered at will, a means is thus afforded for changing the level at which the slag is run off over a range of 24 in., which is a very great advantage in itself; but, in addition to that, there is this further facility, namely, that nothing hinders one from tapping the melted ore at this same slit.

I shall not dwell at length upon the advantages of such an arrangement, but will simply state that during the six years since I have been making use of it I have been unable to find any fault with it, and that in my practice it has always possessed all the advantages of the closed breast. In the said model I have also applied three rows of tuyeres made of gun metal overlying one another in such wise that the upper row is 2½ meters above the first. These tuyeres reach into the interior of the blast furnace as deeply as the blast tuyeres. By means of this plan the walls of the hearth are kept in perfect preservation, and in case of accidents the blast may be introduced through the said tuyeres, which will afford advantages that ironmasters will be able to appreciate without any further explanation of mine. Practice has shown that this kind of blast furnace, being readily accessible on all sides, and at any moment, is far more easily managed than any other system, which fact practical men will readily admit. Over and above the advantages enumerated, there is another, namely, that the construction of such a blast furnace must evidently be, and is, in point of fact, much less costly than that of any furnace built upon another principle. It takes much less time to build, to dry, and to fire; in fact, it is a practical elucidation of your English proverb, "Time is money." Let me add, too, that there is nothing to prevent the application of my system to blast furnaces of all shapes and sizes, and that the largest section would just be the one best adapted for illustrating its great advantages, no less, speaking relatively, than its saving qualities. In conclusion I must say that, to my mind, this system is the most advanced in simplicity of blast furnace construction.

[The illustrations on page 1, for which we are indebted to *Engineering* and *The Engineer*, are as follows. Fig. 1 and Fig. 2, sectional views of blast furnaces on Buttgenbach's system; Fig. 3, perpective drawing of blast furnace on Buttgenbach's system, exhibited at the Vienna Exposition; Figs. 4 and 5, front view of closed hearth; Fig. 6, sectional elevation, with ground plan].

* Read before the Iron and Steel Institute at Liege.

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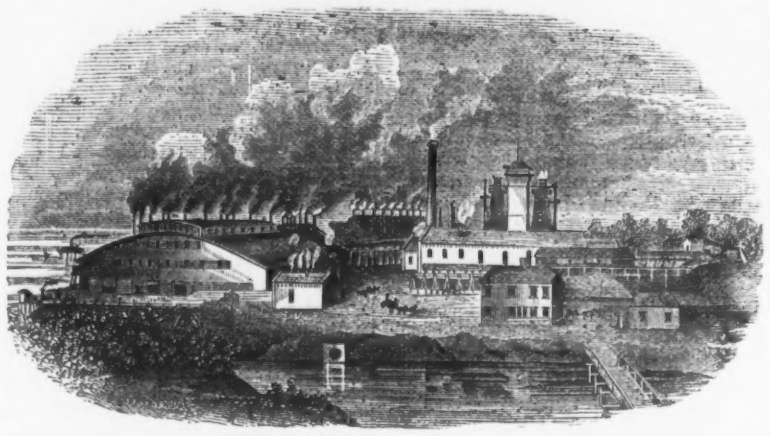

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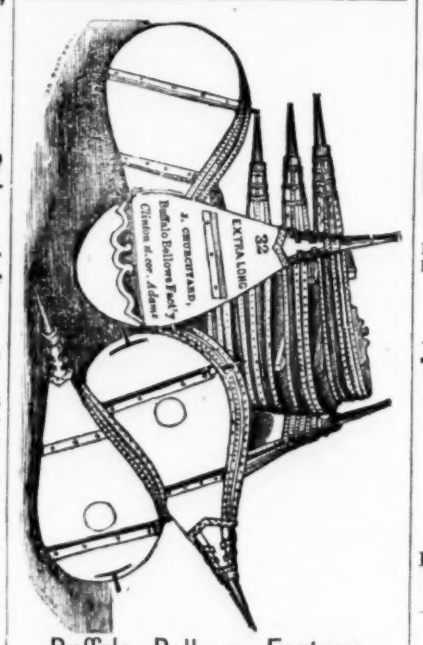

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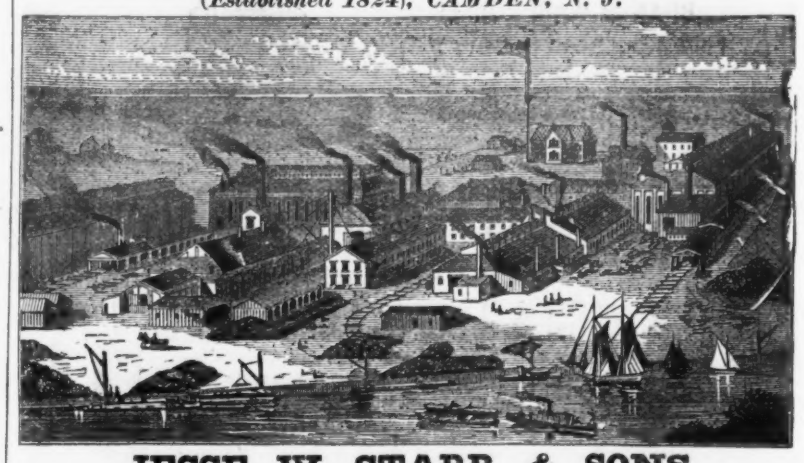

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SECOND FLOOR.

The Iron Industries of Lake Superior.

The Lake Superior Iron Co.'s Furnaces—Peat as Fuel—Statistics of Production, &c.

(Correspondence of *The Iron Age.*)

MARQUETTE, MICH., Aug. 25, 1873.

To all who are interested in the future development of the iron interests of this country, a visit to the famous iron regions of Lake Superior cannot fail to prove in the highest degree interesting and instructive. The trip from the East by way of the lakes is one of the most enjoyable that can be taken, and is becoming more popular every year. The scenery along the route, where visible—as in the Detroit and St. Clair Rivers, the river and Sault of St. Mary, and the bays opening into that grandest of fresh water oceans, Lake Superior—is exceedingly picturesque and attractive; and to those who seek relief from the harrassing care and turmoil of business life in our large cities, the sensation of complete rest experienced, as one passes hour after hour in an easy reclining position upon the upper deck of the steamboat, taking in the surrounding scenery with a languid interest, as it were a sort of day dream, is as refreshing to the nervous system as the pure air and fresh breezes are invigorating to the physical.

The trip from Cleveland to Marquette lasts about three days. At the latter place is a good hotel, pleasantly situated, fronting on the bay, to which during the summer season many of those capitalists who are interested in the mines bring their families. The city itself is quite an attractive one, containing nearly 7000 inhabitants, well built up and growing fast. On the shores of the bay two furnaces have already been erected. One of these, the Grace Furnace, the property of the Lake Superior Iron Company, is the newest and most complete one in the district. Its construction was commenced in May, 1872, and it went into blast in December of the same year. It is situated on the Eastern shore of the bay, having a water frontage of 2000 feet, which is occupied by docks for the reception of the fuel and limestone brought from below. The stack is an iron jacket, lined with fire brick, with iron entablature resting upon supporting columns; its dimensions are: hight 60 feet, width of boshes 17 feet, width of hearth 7 feet, 6 inches. The tuyères are seven in number, having nozzles 3 inches in diameter, and are provided with valves above the elbows for regulating the admission of air. Charging is effected with the usual bell and hopper arrangement. The waste gases are taken off at one side of the furnace, and are brought down to a reservoir at the ground level through a 6 feet vertical main; various flues lead thence to the boilers, hot blast ovens, and calcining kilns. The hearth is provided with water boshes and slag discharge, and the tuyere frames and other castings cooled by water. The hot blast ovens in the rear of the furnace are two in number, having combustion and heating chambers, the pipes being of the U pattern, with flattened elliptical cross-section. They heat the blast to a temperature of 850° Fahr.

The boilers on the side of the casting house, and between it and the stock house, are three in number, each 42 inches in diameter and 26 feet long, with two 16-inch return flues. They are insufficient for the purpose, and more will be put in soon. The main stack is 100 feet 6 inches high. Heaters containing 180 feet of 2-inch pipe, put the water into the boilers at nearly the boiling point.

Hoisting is accomplished by means of one of Otis Bros. engines, which are now used at many furnaces. The blowing apparatus consists of one vertical direct acting engine, with blowing cylinder 84 inches in diameter; steam cylinder, 34 inches, and stroke of 4½ feet; the blast main being 30 inches in diameter.

Two calcining kilns of the Gjers pattern are now in use, having a capacity of 20 tons each. The ore used is the second grade, or "mixed" ore, from the mines of the company. It is largely mixed with red quartz in bands, and contains about 35 per cent. of iron. The gas originally entered the kiln from a chamber underneath, through apertures in the bottom plate and discharging cone, but the ore splinters and crumbles to such an extent as to choke up those in the former, and it became necessary to enlarge those in the discharging cone.

The casting and boiler houses are of stone with iron truss roofs. The stock house is of wood covered with iron plates.

The limestone used comes from Kelly's Island, Lake Erie, one ton of it being used per ton of iron produced. Anthracite, Connelsville coke, Brier Hill and Straitsville coals, are used in equal proportions as a fuel. About 35 tons of iron are produced per day.

Perhaps the most interesting things to be seen in the district, in connection with iron smelting, are the furnace and peat works of the same company, at Ishpeming. The original dimensions of this furnace were: hight, 20 feet; diameter at boshes, 6 feet 7 inches; but it has just been enlarged to 43 feet in hight, and 9 feet wide at the boshes. In its former condition a run of 15 days duration was made on peat alone, and 200 tons of iron were made with it, but from the fact of the furnace not being well adapted to its use, and from want of proper experience as to its action, a salamander was produced, and the furnace had to be blown out. Another attempt will now be made to use a mixture of one-half peat and one-half charcoal. The furnace has been completely rearranged, and all of the apparatus is of a good order. The waste gases are taken off at each side of the furnace, below the discharging apparatus, by flues, and led down to the boiler at one side, and to the hot blast ovens at the other. Horizontal blowing engines are in use here, the blowing cylinder being 34x40 inches in size, and the steam cylinder 12x22 inches. A pressure of blast of from 1½ to 2 lbs. will be used. The furnace is provided with three tuyeres, only two of which will be regularly used; in case of its being necessary to employ coke or anthracite, the other will be brought into play.

The gas flues have all been much enlarged, as peat gives a much greater volume of gas than other fuels. Under the single boiler in use, which is 44 inches in diameter and 24 feet long, is a bridge wall communicating through its ends with the external air, and having holes pierced through its back to provide an additional supply of air for the combustion of the gases. The furnace itself is constructed of masonry up to a few feet below the top, where it is iron jacketed.

The peat excavations and drying beds are quite interesting. The deposit of this material hereabouts is very large, extending through from Lake Michigan to Lake Superior, a distance of 150 miles. In the present workings at Ishpeming the bed is about 8 feet in thickness, but further in the bog it has been found to be over 20 feet in depth. The excavation is conducted with very little labor, one man being able to take out about 20 tons in a day, at an expense of 50 cts. per ton. The workings are kept dry by keeping one side higher than the other, and pumping out the water which accumulates on the lower side.

There are two different varieties of peat in the deposit; that nearest the surface shows the fiber of its components quite plainly, but that which is deeper in the stratum, called from its appearance "liver" peat, is perfectly homogeneous, and when dried strongly resembles cannel coal. Let any one who discredits the theory of formation of coal beds from the peat bogs of the carboniferous age, visit these or similar deposits, and he cannot fail to be convinced of its correctness.

The peat is loaded into cars in the excavation, and hauled up a long incline, by engine power, to the dump, where it is led into a cutting mill, consisting of a horizontal cylinder with projecting knife blades, revolving in a cylindrical box. In this the fiber is completely destroyed, and much of the water removed. It is then carried to the drying floors, which consist of a series of rectangular beds of plank with sloping sides, between which run the tracks and walks. The plank used in the construction of the beds is of unsaleable quality, and the bed rests upon logs, so as to allow of the circulation of air through the material, which is spread out in a layer from 1 to 2 inches thick. It soon settles down to an even surface, and after being left for several days exposed to the air, cracks up into pieces, which are then turned over or set on edge. From 7 to 10 days are required for thorough drying, ordinarily, though, of course, wet weather will retard the operation. At the end of this time the peat is comparatively dry and hard, but is still unfit for use, and is placed in store houses roughly constructed of inferior planking, with open joints in the sides, but water-tight roof. Along the center of the floor, which is supported on logs, runs a flue of triangular section, built of slats with open joints. The air entering this can circulate upward through the mass in every direction.

One hundred and ninety thousand square feet of drying surface are now available, which will be increased to 300,000 square feet, should their experiment in the furnace prove successful. With the latter amount about 75 tons can be produced per day. The expense of the entire operation, including excavation, will be $2·50 per ton, and it will cost 50 cents more to deliver it at the furnace.

When well dried, this peat weighs 35 lbs. to the bushel. It is quite hard and compact, and upon a smooth surface will receive a fine polish. It is really surprising, indeed, that in this simple manner, without the use of pressure, so good an article can be made.

About 60 bushels of peat, in admixture with the same quantity of charcoal, will be required per ton of iron produced.

Thus far the enterprise has attained to no decisive results, but its movers are hopeful, and willing to give capital and time to its development, and when we consider that the mode of preparing peat is as yet imperfectly understood, as well as its application to smelting purposes, it is reasonable to hope that some day it will be economically applied. Meantime all will watch for the result of this experiment with great interest.

The total number of furnaces in the district is 20. The following table gives the production of each for the year of 1872:

Furnaces.	Gross tons.
Pioneer (2 stacks)	6,985
Collins	3,431
Michigan	4,001
Greenwood	4,212
Bancroft	4,256
Morgan	4,356
Champion	5,006
Deer Lake	2,720
Jackson (2 stacks)	10,080
Schoolcraft	2,500
Bay	4,900
Marquette & Pacific Rolling Mill	4,332
Ishpeming Peat Furnace	200
Total	63,195

These are all, with one exception, charcoal furnaces. The total production of pig iron in the district from 1858 to 1873, inclusive, was 357,880 tons. All the above furnaces use hot blast. The blast is heated in ovens containing from 18 to 30 ox-bow pipes, to from 450° to 650° Fahr. The tuyere nozzles are from two to four inches in diameter, and the pressure of blast varies from 1½ to 2½ lbs.

The furnaces are usually 40 feet high and 9½ feet wide at the boshes, which are about 13 feet from the bottom. The diameter of the hearth is about one-third of that of the boshes—the mouth about one-half. The boshes are quite steep, sloping at an angle of one-quarter to one.

Four-fifths of the charcoal employed is made from hard maple; yellow birch, hemlock, pine, and other soft woods are also used for this purpose. About 100 bushels of hard and 140 bushels of inferior charcoal are used per ton of iron produced. Its average cost is 12 cents per bushel. Several of the furnaces use water power, and a number have banks level with the furnace mouth.

In my next letter I shall send you some account of the noted mines of this region.

A New Process for Iron Smelting and Other Purposes.

Messrs. Smith and Willans, the latter a mechanic in the employ of the well-known firm of Hopkins, Gilks & Co., of Middlesborough, have lately secured letters patent on an improved process for smelting iron and other ores and for reheating metals, which seems to contain enough of novelty to entitle it to careful consideration.

In smelting iron ores by this process the ores are prepared in the usual way, and with the required proportions of coke or coal and flux are charged into the blast furnace, where they are reduced or smelted by the joint action of the combustion of the coal or coke, and the inflammable gas and air which is introduced into the furnace through the tuyeres. The inflammable gas is generated by passing highly superheated steam through the red hot coke or other carbonaceous matter contained in heated vessels. The gases so produced are permanent and are farther superheated before leaving the converter, from which they pass through the tuyeres into the furnace. In the tuyeres they meet and mix with a current of atmospheric air, by union with which combustion, with an intense reducing flame, is produced.

The machinery employed consists of a distillatory apparatus for producing gas from coal, etc., a converter for producing the inflammable gas by passing superheated steam through red hot coke contained in vertical vessels, and a compound tuyere. The distillatory apparatus consists of a series of retorts arranged concentrically with a pair of discs which revolve within an annular ring that is set in the brickwork of the stove. The converter consists of a series of vertical vessels, arranged to revolve about a vertical hollow axis, enclosed within a flame chamber, and fitted with suitable inlet and outlet pipes. The tuyere consists of two fixed or moveable nozzles with an adjusting spindle; the air and gas pass through the outer and inner nozzles respectively, and combine in the required proportions within the furnace.

When the process is applied to the manufacture of gas, according to this invention, the coal is charged into the revolving retorts, and distilled in the usual manner, when the gas may either be allowed to pass on to the ordinary purifiers and thence to the gasometer, or it may be passed through the incandescent coke contained in the rotating converter, where it will be subjected to the action of a current of decomposed steam; the result of this union being the production of a large quantity of gas of high illuminating power.

Instituting a comparison between the effective heat obtained in the present process of making iron (as given by Mr. I. Lowthian Bell in a paper on the Ormesby Furnace, read to the Iron and Steel Institute, and published in the Journal of that Society in 1869, p. 85) and that according to their proposed new plan, Messrs. Smith and Willans assert that by the use of their process the combustion of 11 cwt. of coke, required for the production of 1 ton of pig iron, will yield 112·793 effective heat units for furnace work; as against 69·830 heat units effective for furnace work obtained from the combustion of 22 cwt. of coke requisite for the production of 1 ton of pig iron in the ordinary way. These figures establish a difference of about 69 per cent. in favor of Messrs. Smith and Willans' process, which, if confirmed in practical working on a large scale, would constitute a very important improvement and economy.

From the foregoing data, the following advantages are claimed:

1. A reduction in the total quantities of coke and limestone used in the production of a given quantity of pig iron, equivalent to 11 cwts. of coke and 8 cwts. of limestone.

2. An improved quality of metal, due to the affinity of hydrogen for sulphur and phosphorus, by which these impurities are more thoroughly eliminated, as this gas will perform the duty usually devolving upon the excess of limestone. Inferior ores and brands of iron treated according to this process will become available for the purpose of the steel maker.

3. An increased make of iron.

4. A saving in the first cost and subsequent maintenance of blast furnace plant, due to the entire abolition of blowing machinery, and to the smaller quantity of materials to be lifted to the top of the furnace, equal to 25 cwt. to the ton of iron, with a farther saving of at least 10 cwts. of slag.

5. Under the present plan the large amount of heat required to raise steam for the high pressure blast engines is thrown into the atmosphere with the exhaust steam and entirely lost. Under the proposed plan this heat is absorbed by the gases of the decomposed water and is carried into the inside of the furnace, where it is again evolved; thus the same heat, instead of being lost, is continuously used over again.

6. When applied to the making of illuminating gas, the production of gas of a superior quality and in greater quantity from a given quantity of coal, with a very considerable reduction of manual labor.

Moreover, in using an inferior quality of coal, the gas generated, either with or without petroleum or other liquid or gaseous hydrocarbon, when subjected to the action of a current of decomposed steam in passing through the converter containing red hot coke or charcoal, will produce a permanent gas of high illuminating power, which will not condense in the pipes.

7. In connection with the manufacture of puddled iron there will result an increased make from the same quantity of pig, the iron being neither burnt nor oxidized, as the proportion of air to inflammable gas may be duly regulated by the apparatus. The iron will also be more rapidly made, "coming to nature" sooner by reason of the great heat evolved in the furnace; and its quality is improved. Economy in fuel and perfect control over every stage of the process are among the other advantages claimed.

Cold Rolled Shafting.

The following recent tests of cold rolled shafting, manufactured by Messrs. Jones & Laughlins, of Pittsburgh, and which took a medal at Vienna, will be found interesting. The first series of experiments were conducted by Mr. W. Wade, of the United States Ordnance Department, and the summary of about sixty tests is given in the following table. The cold rolled iron was in each case compared with precisely the same class of bar iron produced in the usual way:

	Iron Rolled while		Ratio of Increase due to Cold Rolling.	Average Rate of Increase per cent.
	Hot.	Cold.		
1. Transverse Strains: Bars supported at both ends, distance of bearings 80 in., load applied in the middle. Weight which gave a permanent set of one-tenth of an inch, to:	lb.	lb.		
1½ in. square bars	3,100	10,700	3·451	
Round bars, 2 in. in diameter	5,200	11,100	2·134	162½
Round bars, 2½ in. in diameter	6,800	15,600	2·294	
2. Torsion: Weight giving a permanent set of 1°, applied at a distance of 25 in. from the center of the bar: Round bars, 1¾ in. in diameter, and 9 in. between the points of attachment	750	1,725	2·300	130
3. Compression: Weight giving a permanent set of one-hundredth of an inch to columns 1½ in. long and ⅝ in. in diameter	13,000	34,000	2·615	161⅙
Weight giving a permanent set to columns 8 in. long and ¾ in. in diameter: Puddled iron	21,000	31,000	1·476	64
Charcoal bloom iron	20,500	37,000	1·804	
4. Tension: Weight per square inch, giving a permanent set to rods ⅝ in in diameter: Puddled iron	37,250	68,427	1·837	93
Charcoal bloom iron	42,439	87,896	2·059	
Breaking weight per square inch for the same rods: Puddled iron	55,760	83,156	1·491	72
Charcoal bloom iron	50,927	99,203	1·950	
5. Hardness: Weight required to produce equal indentation	5,000	7,500	1·500	50

The second series were made by Mr. John C. Whipple, Chief Engineer of the United States Navy, to determine tensile strength only. The following are the results obtained:

Quality of Iron.	Sectional area of bar tested.	Breaking weight of bar.	Breaking weight per sq. in.	Increase of strength in Polished Iron
	sq. in	lb.	lb.	lb.
Polished iron	·1824	19,125	104,852	
Black iron	·4249	22,750	53,541	51,311
Polished iron	·1712	16,875	93,100	
Black iron	·4515	27,000	59,797	33,403
Polished iron	·1599	13,125	82,600	
Black iron	·4249	22,750	53,541	29,059
Polished iron	·1844	20,750	112,527	
Polished iron	·1855	21,250	114,555	

The following results were quoted in the report by the Franklin Institute of Philadelphia on the twenty-sixth exhibition of American manufacturers:

1. *Tensile Strength.* lb. per sq. in.
   - No. 1. Inferior quality, broke at 49,510
   - Same bar, cold rolled 66,862
   - No. 2. Ordinary bar, broke at 57,350
   - Cold rolled 92,623
2. *Resistance to Torsion:*
   - No. 3. Round black bar, 1 5-16 in. diameter. Length of lever, 25 in.; twisted with a strain of 587½ lbs.
   - Cold rolled, same quality, 1¼ in. diameter. Length of lever, 25 in.; twisted with a strain of 1000 lbs.

Experiments were also made by Sir William Fairbairn confirming the previous results, and showing a comparison of the cold roiled with turned bars. A brief summary of these tests is subjoined:

Condition of Bar.	Area of Bar.	Breaking weight of bar in lbs.	Breaking weight per square inch. lbs.	Breaking weight per square inch. tons.	Strength: Untouched Bar being Units.
Untouched (black)	·85873	50,340	58,624	26·173	1·000
Rolled cold	·7854	69,295	88,230	39·388	1·500
Turned	·7854	47,710	60,746	27·119	1·036

These tests show conclusively that the strength of shafting is increased by the process of cold rolling, a fact which is proved still more satisfactorily by the economy which has attended its very general use in this country.

Messrs. Wilkinson & Taylor, of Birmingham, have lately invented an improvement in apparatus for casting metals, which is well spoken of. The invention consists of machinery or apparatus to be used for casting long or continuous ingots, bars, or strips of metal, to be afterward rolled into plates or drawn into rods or wires. The said machinery or apparatus consists essentially of a nearly vertical traveling or endless mold, composed of two series of endless bands of jointed plates, supported by and working over drums or pulleys. The plates of one series are of a trough form, open at both ends, and the plates of the other series are flat. The said two series of endless bands of jointed plates are so arranged with respect to each other that in their descending motion they are brought together and constitute an endless mold, and in their ascending motion they are separated from one another. The flat plates are pressed into close contact with the trough-shaped plates by springs. The two series of plates are geared together and worked by racks and pinions. In using the machinery a temporary bottom is fixed in one of the trough-shaped plates, and motion being given to the endless bands of jointed plates, molten metal is poured into the apparatus through a funnel fixed at the highest point of the machine. The ingot or bar formed by the solidification of the metal passes out at the bottom of the machine, the temporary bottom of the mold passing out in front of the ingot or bar.

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All Nicholson Files are cut with the Patent *Increment Cut*, an invention owned and controled exclusively by us, the file cut in this manner being Patented as a new article of manufacture, and differs from all other machine cut files (all of which have their teeth cut with equal spaces) by being cut with teeth slightly *expanding or increasing in size and space from the point*, thus avoiding the too great regularity of teeth common to all other machine cut files. The tendency of all cutting tools with teeth or cutters placed at regular distances from each other may be illustrated (to the machinist at least) by the fluted reamer—as it is well known that if a round reamer be made with (say 12) teeth whose spaces are equidistant, the hole reamed will *not* be round and smooth, but will approximate to a hexagon in shape. Whereas, if the same number of teeth be made of irregular distances, the hole reamed will be both round and smooth. The same is true of a file, hence the necessity of its having teeth at unequal distances, and to which we have applied the name of Increment Cut File, which possesses all the advantages of hand cut work, and the accuracy and uniformityof machine work. It is now upwards of seven years since this File was introduced to the public, and the demand has increased until our production is undoubtedly treble that of any File manufactory in the country.

We put all files under seven inches in boxes of either one-half or one dozen each. These boxes are neatly arranged, and open on the end, on which the kind is plainly marked with printed labels, acknowledged improvements on the old methods.

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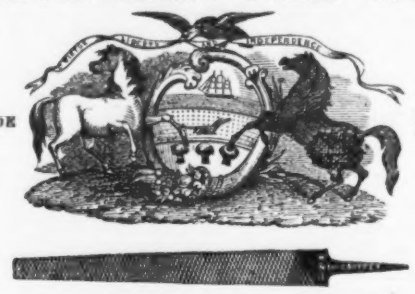
TRADE  MARK

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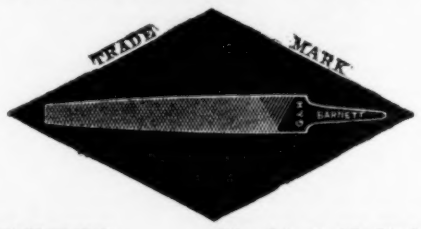

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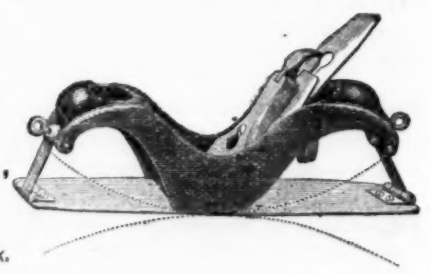

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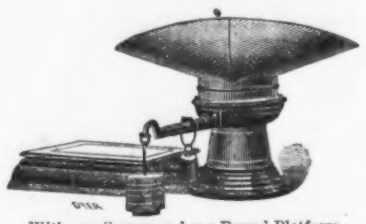

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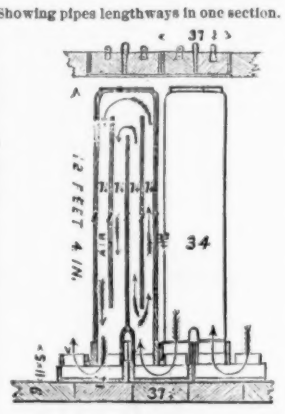
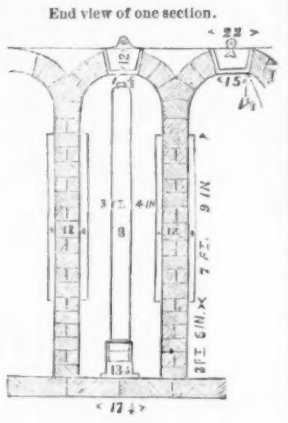
Showing pipes lengthways in one section.



End view of one section.



REFERENCE.

PHILADELPHIA, Nov. 16, 1872.

PAULDING, KEMBLE & CO.:

GENTLEMEN: We have five sections of the "Ford's" Ovens in use since blowing in our new Furnace on the 21st of October. The Ovens have given entire satisfaction; we consider them superior to any Cast Iron Oven in use; they heat the air to a greater degree with much less gas and heat on the brickwork than the Player Ovens; they cost less for construction, and, we believe, will prove more durable, and less expensive to keep in repair. Our main difficulty thus far has been to keep the heat down to 1000 deg; our average is from 1100 to 1200 deg.

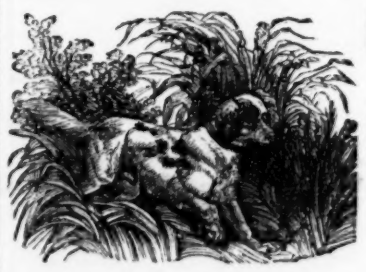
In all cases the Cast Iron Key Boxes to form the arch should be filled in lightly with fire-brick blocks, laid dry and covered with loam, or, *better*, a cast iron plate, to cover the top, with a ring in it, so as to be easily removed.

We built our ovens in one block, entirely of *fire brick;* the cost of the brick work entire was about 5000 dollars, say about 1000 for each oven.

We put 4 courses of fire-brick in the bottom, laid on a loose slate rock, laid dry, and well grouted each course with Kaolin grout.

We can recommend the Ford Ovens with great confidence to iron men who wish to construct the best kind of ovens in use in the United States. Yours, truly, J. B. MOORHEAD & CO.

P. S.—Our Furnace is now on her 3d week, making about 28 tons per day good Foundry Iron—15 feet bosh, 50 feet high.



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New Union Steam Safety Elevator,

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RIVERSIDE IRON WORKS, DEWEY, VANCE & Co., Wheeling, W. Va., January 14th, 1873.

Messrs. OTIS BROTHERS & Co., New York.

Dear Sirs: The experience of a year proves that ***your Furnace Elevator is superior to all others in use.*** We have in the six weeks from December 1st to Sunday last, 12th inst., made ***9724 tons, 1401 lbs. Pig Metal,*** or an average of near ***65 tons per day,*** which required the elevator to ***lift 72 feet high*** 4½ tons Ore, Coke and Limestone for each ton of metal produced, or ***more than 11,500 tons material in the 6 weeks.*** The largest yield in ***one*** day was ***81 1-4 tons*** Iron, involving the lifting of ***345 tons*** material ***in 24 hours.*** This has all been done to ***our satisfaction,*** and that, too, in the ***coldest weather we have had.*** Other furnaces with ***water*** and ***pneumatic hoists*** have experienced ***great difficulty,*** on account of the ***water freezing*** in the ***tanks;*** and in the case of the ***air*** hoists, we understand that two furnaces, not far from us, ***had*** to ***"blow out,"*** from being ***unable to hoist stock*** during the ***"cold snap."*** The difficulty, we are told, was caused by the ***condensed moisture*** in the ***blast freezing to the sides of the cylinders,*** so that the ***piston could not move*** up or down.

Very truly, yours, DEWEY, VANCE & Co.

Send for Circular to

OTIS BROTHERS & CO.

348 Broadway, NEW YORK.

BUSINESS ITEMS.

NEW YORK.

The Brooks Locomotive Works, at Dunkirk, recently turned out a new locomotive, called the "Jay Gould," for the New Jersey Southern Road, having 17x24 inch cylinders, and driving wheels 5 feet in diameter. This locomotive, which is intended for passenger service between Sandy Hook and Long Branch, is described as being very finely finished and ornamented. The Brooks Locomotive Works now employ about 450 men, and turn out seven locomotives per month, with a large number of orders on hand.

NEW JERSEY.

The Joseph Dixon Crucible Company, of Jersey City, are doubling the size of their factory, in consequence of the growing favor which their manufactures find throughout the Union, employing, as the company does, 150 hands. We have already given notice of the company taking a medal at Vienna. Dispatches received since, show that instead of one they took two. The firm is one of the oldest in the country now, being 46 years old.

PENNSYLVANIA.

Messrs. Reese Brothers, of Pittsburgh, are engaged in the manufacture of stove pipe iron, which is supplied to the trade cut to exact size, beached and lapped, when it is put up in packages of 50 feet. It is claimed that the dealer and tinner can save from 10 to 15 per cent. in using this iron. This firm also supply the trade with all varieties of sheet iron.

G. Dawson's new blast furnace, at North Lebanon, was blown in a couple of weeks ago. It has an iron stack 35 feet high, with 16 feet bosh.

The contract for the new pumping engines for the new water works at Pittsburgh was awarded to Messrs. Hartupee & Co., their bid having been $375,000. There were but two other competitors, whose bids were $393,340 and $412,500, respectively. These engines are to be similar to those at present being constructed, except that they will have double cylinders. Each engine will have an estimated capacity of 41,000,000 gallons per day.

Ambrose McHose, Esq., of Reading, has been elected superintendent of the Millerstown Iron Company's works. It is expected that their new furnace will be making iron by the first of the new year.

The new blast furnace of Messrs. E. & G. Brooke, on the line of the Philadelphia and Reading Railroad Company, a short distance above Birdsboro, is rapidly nearing completion, and will commence operations in a few weeks. The casting-house is 125 by 50 feet. The engine was built by I. P. Morris & Co., and is what is termed a low-pressure or condensing engine, and is rated at three hundred horse-power. The furnace is calculated to make about two hundred and twenty-five tons of pig iron per week, and will require the labor of about forty men in and about it. All the buildings are roofed with slate, and it is said that for completeness in all its parts it has few if any superiors in old Pennsylvania. About five hundred tons of wrought and cast iron entered into the erection of these works, to say nothing of stone, brick and lumber.

Messrs. Gibbs, Sterrett & Co., of Titusville, have filled an order for a complete set of drilling tools to be sent to New Zealand, which are to be used in developing some supposed oil springs in that country.

The contract for the wrought iron work of the roof of the south wing of the great building now going up for the use of the State, War and Navy Departments, at Washington, has been awarded to the Architectural Iron Works, Philadelphia, for $39,629·43. The other bids were three from New York and one from Chicago.

The Alleghany Car and Transportation Company, whose works are in process of construction at Braddock's Fields, near Pittsburgh, has elected Gen. A. C. Russell, president, in place of S. M. Kier, resigned.

Good progress is being made on the Keystone Iron Company's furnace at Chain Dam. The iron casting of the stack is already towering several feet above the foundation.

Roofing iron is being shipped to Canada by Messrs. Reese & Bissell, of Pittsburgh, and there are indications that they will have an important trade in that direction.

Messrs. L. H. Smith & Co., Pittsburgh, having given up the general foundry business, are giving special attention to the manufacture of the Patent Reflector grates and stoves.

CONNECTICUT.

The Norwalk Iron Works have received orders from the Topeka Iron and Steel Works for seven engines, the largest of which is 600 horse-power. The works, when in full operation, employ 200 workmen.

The Naugatuck Railroad has just completed, at its shops in Bridgeport, one of the finest passenger cars ever built in that State, at a cost of $8000. The materials used in the paneling are Hungarian and domestic ash, and French and American black walnut and mahogany, with gilt moldings running round the upper deck. There are four separate floors, which are firmly fastened together, rendering it impossible for dust to penetrate from beneath, and giving additional strength to the car.

Filmer & Stone are erecting a foundry at Fair Haven, for the manufacture of printer's leads.

About eighty tons of iron rods, rounds and squares, are turned out daily at the Stillwater Rolling Mill, at Stamford.

MAINE.

The Northville Scythe Factory, at Newport, when it is enlarged and furnished with new machinery, will be operated by the Sibley Scythe Company, recently organized.

Mr Castle, at his Belfast Foundry, did some heavy casting recently in the shape of four large carriage trucks, weighing 1000 pounds each. They are for Bodwell & Co., of Vinalhaven, and and are to go into a huge carriage used in hauling granite from the quarries.

RHODE ISLAND.

Mr. J. A. Charnley, of Providence, enjoys the reputation of being one of the most skillful die and roll cutters in the United States. He established himself in the practice of that art about twenty years ago, and has built up an extensive business. His specialty is die cutting for jewelers. He gives special attention to enamel and gallery sitting and ring rolls, and manufactures the Charnley compound hand roll frame for rolling all kinds of stock. His factory, at 70 Peck street, is supplied with a large amount of fine machinery, much of which was invented by himself, which is driven by steam power. Mr. Charnley's work is held in the highest esteem, not only in Providence, but in other places where jewelers' machinery is sold.

The firm of Samuel Cope & Co., of Pawtucket, carry on the business of file-making on an extensive scale, manufacturing files and rasps of all kinds and of approved excellence. They occupy a factory at the corner of Church and Hill streets, in which they employ a working force of twelve hands. The business of manufacture in all its stages is carefully supervised by Mr. Cope, who is esteemed one of the most skillful representatives of the trade. He has had many years experience in file making. The present firm, of which he is the senior member, was organized during the current year, and has already established an extensive business.

OHIO.

We learn from the Ironton *Commercial* that the recent rains have retarded the progress of the building of the furnaces now being erected by the Etna Iron Works Co., and the Iron and Steel Co., by partially filling the excavations for the foundations of the hot blasts.

Perrysburg is to have works for the manufacture of silicon steel.

On the 24th ult. the bridge, pot house and engine house at the Etna furnace, 10 miles from Ironton, were destroyed by fire. The machinery was also damaged to an unknown extent. Loss, considerable. The damage is being repaired, and the furnace will soon be in blast again.

S. P. Chandler & Bro., Wadsworth, manufacture threshers, horse powers, cultivators, plows, scrapers, &c., &c. They have been established since 1866. Their factory is 80x100 feet and two stories; shed, 25x60 feet; store and paint shop, 40x100 feet. Twenty-five hands are employed. They make a specialty of the manufacture of the Oviatt Threshing Machine, which is one of the most successful machines on the market, possessing many advantages. They also manufacture the Oviatt sled, of which over 6000 are now in use. All their work is warranted.

The rolling and tin mill, at Wellsville, is in full operation, and the machinery and quality of the product are said to be satisfactory. This is the first tin works put in operation in the United States. The capital stock of the company is $60,000, and we understand that the works will give employment to 300 men.

Messrs. Day & Russell, Cincinnati, have recently commenced the manufacture of a very superior horse shoe blank for track and road purposes, of rolled carbonized iron, with steel surface and wrought iron center, the object of which is to facilitate and render more economical the formation of horse shoes with narrow bottoms and broad tops, which is done by passing the bar of metal through rolls of such shape as to form a continuous groove, which is then cut and bent to shape, the groove being on the inside of the shoe, and the inside angle of the bottom thus brought nearer to the outside edge. The shoe is completed by sinking a nail groove on the outside. The superiority claimed consists in its hard steel surface, while it still retains its elasticity and toughness by means of the wrought iron center; beside, owing to its narrow bottom surface and natural shape, it enables the horse to place his foot firmly on the ground without slipping, and to spring again without losing any foot-hold. They have ample facilities for supplying the trade with either shoes or grooved bars.

MICHIGAN.

The iron works of the Pigeon River Furnace and Salt Company, at Caseville, are nearly completed, and, when in operation, will add no small amount of business to the place, consuming annually over 6000 tons of iron ore, and 10,000 cords of wood. The company contemplates using the surplus hot air for making salt.

The Wyandotte Rolling Mills have prepared a great variety of specimens of Michigan iron for exhibition at the approaching State Fair. They comprise samples of the ore in the condition in which it is taken from the mines, and then illustrate the various stages of its manufacture, all the way from the crude pig to the perfected railroad rail and boiler plate.

The Wyandotte *Enterprise*, of Aug. 22, says: "In the manufacture of steel rails, it is found impracticable to work up the ends into rails, as in the case of iron, and other disposition is made of them. Large quantities are purchased for rolling into beams and girders, the material being useful for that purpose after reheating, though not for rails. With a view of increasing the amount of work to be done in the mills here, S. L. Potter, secretary of the Ward Rolling Mill Company, has gone East to make arrangements for machinery and the purchase of the material for the production of that branch of the business here. It is designed to have the rolls interchangeable with those in the rail mill, so that when not at work on rails, the men will be employed in making the beams. Mr. Potter will visit Syracuse, Troy, Boston, and we hope he will be entirely successful in his mission."

WISCONSIN.

Minerva Furnace, Milwaukee, with 15 feet boshes and 55 feet stack, was blown in a few weeks ago, and produces about 300 tons per week, the fuel being coke and anthracite coal, and the ores Lake Superior and Iron Ridge. The Minerva Furnace Company are the proprietors, who have a capital of $200,000.

A strike occurred at the Milwaukee Rolling mill on the 28th ult., on account of a reduction of wages. The works were closed and we have not learned that they have been started up again.

CALIFORNIA.

The Marysville Foundry is engaged in the manufacture of steam engines and quartz and amalgamating machinery. The main building is of brick, two stories high, 40x80 feet, with a wing, also 40x80 feet. This foundry has been in operation 21 years. The proprietors are Prescott, Scheidel & Co.

HENRY DISSTON & SONS'

SAW, TOOL,

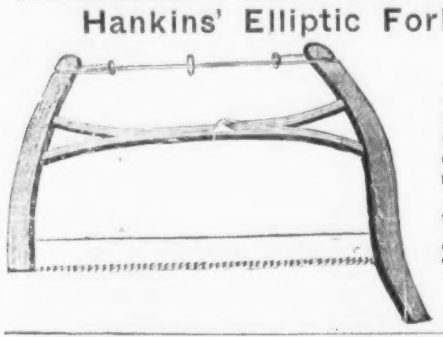
STEEL AND FILE WORKS,

Front and Laurel Streets,

PHILADELPHIA, PA.

Hankins' Elliptic Forked Saw Frame.

Patented June 28th, 1870.



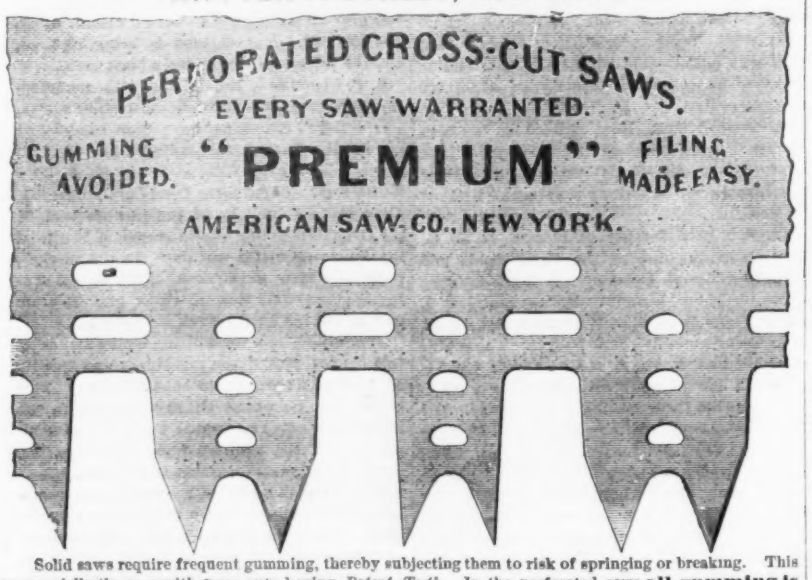
The annexed engraving represents HANKINS' ELLIPTIC FORKED SAW FRAME, which commends itself to the trade for its simplicity of construction. The Forked Brace being all in one piece, without any centre bolt, secures for the Frame great strength and durability.

These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

HARVEY W. PEACE
VULCAN SAW WORKS,
WILLIAMSBURGH, N. Y.

AMERICAN SAW CO.,

No. 1 FERRY STREET, NEW YORK.



Solid saws require frequent gumming, thereby subjecting them to risk of springing or breaking. This is especially the case with cross cuts having *Patent Teeth*. In the perforated saws **all gumming is avoided,** and the teeth are easily kept long and in *proper shape*, saving *files*, *labor*, *expense* and *vexation* As is well known, our saws cut faster, smoother and easier than any other.

MOVABLE-TOOTHED CIRCULAR SAWS AND SOLID SAWS OF ALL KINDS.

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Wood Screws, Steel in Sheets,

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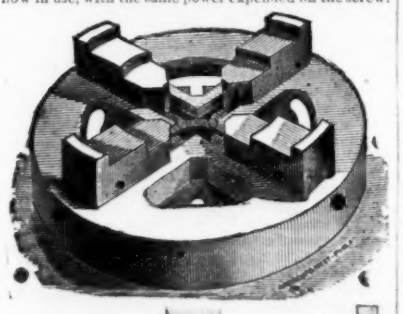
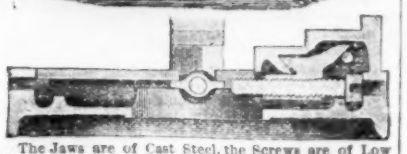
Judson's Patent Lathe Chuck.

THE STRONGEST CHUCK MADE OF THE SAME SIZE AND WEIGHT.

CONSTRUCTED ON ENTIRELY NEW PRINCIPLES, each Jaw being independent in action, and so arranged that the pressure of the Screw toward the center also presses the Jaw firmly against the face of the Chuck, holding the work more securely than any other Chuck now in use, with the same power expended on the screw.





The Jaws are of Cast Steel, the Screws are of Low Moor Iron, Case Hardened, and the Nuts of Malleable Iron. The workmanship is all first-class. The Casting is light, and yet with all necessary strength in the best position to resist the strain.

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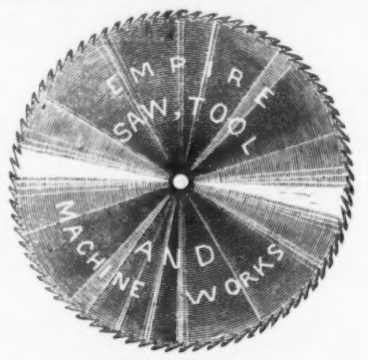

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Saw Grinding Machinery

Of the most approved make, on hand and for sale; warranted to grind either straight or to any given taper or bevel. Sole maker of the

Quadruple Screw Power Press.

General Machine Work executed to order.

I make a specialty of the LARGEST SIZES of **Circular Saws,** and call particular attention of lumber manufacturers to the following points of excellence:

Evenness of Temper.—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.

Perfect Accuracy in Thickness.—My saws are ground on a patent machine, automatic in its operation, grinding off the thick places upon the plate before the thinner parts are reached, and when the saw is removed BALANCES PERFECTLY, which is proof positive of the right accomplishment of the work.

Properly Hammered.—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the rim, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time RUN TRUE. This department is under the personal supervision of myself, who has devoted over *twenty years* to the art of saw making.

I am sole proprietor and manufacturer of the celebrated **"Challenge" Cross-Cut Saw.** Price Lists of all kinds of saws sent on application.

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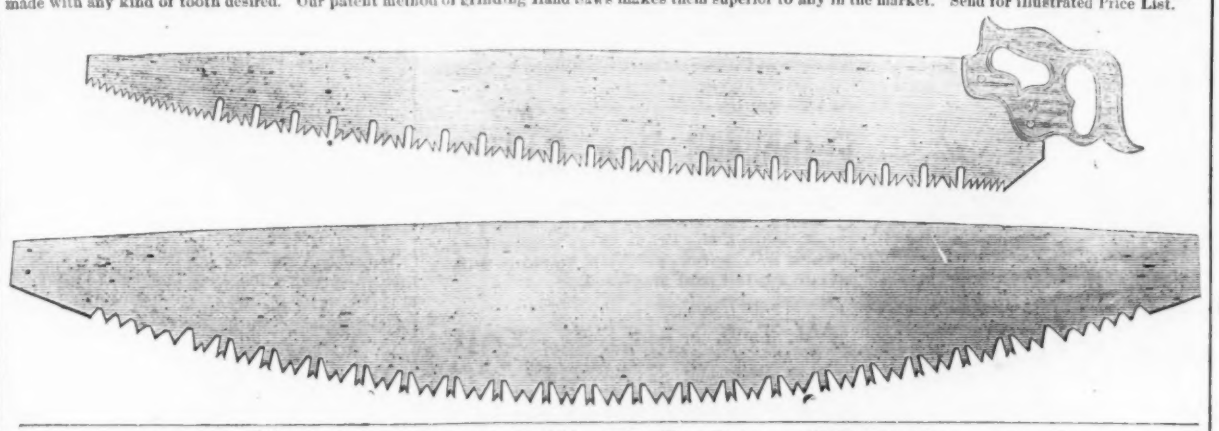

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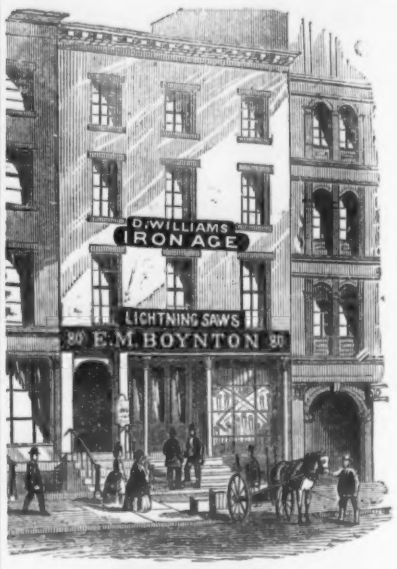
J. J. Anderson, Prest. **Henry H. Trenor,** Treas. **John H. Allen,** Secy.



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Awarded the Medal of the American Institute, 1872.

Two Direct Cutting Edges, instead of one Scraping Point. Note extra steel and durability over the old V, outlined on M tooth.

A Challenge of $500, toward expense of a public test, to prove that the Lightning Saws excel all others in Speed, Ease, and Simplicity, has been offered since 1870, and has never been accepted. More than 100,000 Lightning Saws were sold during the year 1872, the purchasers of which testify to their superior merits.

Our leading papers, such as the *Tribune, American Agriculturist, Christian Union*, etc., have published over sixty editorial notices recommending these Saws. Farmer's Clubs, Lumbermen, and Hardware Dealers unite in pronouncing the genuine Lightning Saw the greatest labor-saving implement of the age.

I have hundreds of letters from practical sawyers, voluntarily written, expressing their entire approval of these Saws.

Where the Hardware Trade do not sell the Lightning Saw, I will send a 6-foot cross-cut and a buck saw-blade on receipt of $7.

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Mowing Machine Sections of all patterns constantly on hand.

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Best Cast Steel Patent Ground Saws.

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Best Patent Handle in use.

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PEN AND POCKET KNIVES,
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We warrant our Knives equal in cutting qualities and workmanship to any made. We also make
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which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal to any other Knife.
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The Measurement of High Temperatures.

BY RICHARD H. BUEL.

For the measurement of ordinary temperatures the mercurial thermometer is generally employed, because mercury retains its liquid state through a wide range of temperature (boiling at 662° Fahrenheit, and freezing at —39°·2), and, except near its freezing and boiling points, expands quite uniformly for uniform increments of heat. According to Reynault, the expansion of mercury is as follows:

Between 32° and 212°, 1 part in 55·08.
" 212° " 392°, 1 " 54·61.
" 392° " 572°, 1 " 54·01.

And beyond these limits it seems difficult to find the law. For indicating lower temperatures, alcohol, which has never been frozen, is commonly employed—and the methods by which higher temperatures are measured will form the subject of this article.

An instrument used to show higher temperatures than can be registered by the mercurial thermometer is called a pyrometer. This name seems to have originated with Muschenbroek, in 1730. His instrument was a metallic bar, fixed at one end and acting on a scale at the other, showing approximately the temperature by its expansion. Many other pyrometers were constructed on this general principle, the chief differences being in the methods employed to read the scale. The expansion of a metallic bar is quite small for a considerable increase of temperature, and hence it is necessary to multiply this reading on the scale. This was first done by arrangements of levers and pulleys attached to the piece moved by the end of the bar, but it was found that there was so much lost motion that the readings were far from accurate. Lavoisier arranged a telescope which was caused to rotate as the bar expanded, and being directed to a distant point, magnified the reading to any desired extent. An instrument on a similar principle was made by Saxton for the U. S. Coast Survey, to determine variations in the length of the measuring rods. One end of the rod was firmly fixed, and the other came in contact with a compound lever carrying a rotating mirror. The reflection of the scale in this mirror was read by a telescope placed at such a distance that one-twenty-five-thousandth of an inch increase in length was magnified to about one-fourth of an inch. With such an apparatus a change of length of one-hundred-thousandth of an inch could be easily noted.

The metallic bar described above was used by Brongniart in 1805 to determine the temperature of an oven in which porcelain was heated for purposes of ornamentation. He employed a bar of silver placed in the oven, the free end projecting beyond and marking its expansion on a scale. This pyrometer, though utterly unsuitable for purposes of accurate research, was quite well adapted for regulating the heat of the porcelain oven, where a temperature of about 1100° was required, and the work was injured if this temperature was much exceeded. Wedgwood's pyrometer, invented in 1782, consisted of a small cylinder of fire clay, flattened on one side, and a metallic scale having a graduated V shaped opening. The cylinder was first placed in this scale, the flat side against one face of the opening, and was moved down as far as possible, and the reading taken. It was then heated in the medium whose temperature was to be ascertained, and again placed in the scale, where the temperature could be at once read off. Wedgwood observed the expansion of silver between 32° and 212°, and compared it with that of the clay cylinder, assuming that 1° on his scale was equivalent to 130° Fahrenheit. It was found, however, that this device was exceedingly inaccurate. It was difficult to obtain clay that was uniform in quality—and cylinders made of precisely the same material gave very different indications, because some were pressed more closely than others. But the worst defect was, that a cylinder exposed for a long time to a low temperature contracted quite as much as one exposed for a short time to a high degree of heat. Its great inaccuracy will be made plain by the statement that Wedgwood determined the temperature of a blast furnace to be 32,277°—while the highest theoretical temperature that can be produced by the combustion of carbon in air is about 4500°—and estimated the temperature of melted iron (since determined to be about 2800°) at 20,577°.

The first pyrometer with any pretentions to scientific accuracy, was invented by Daniells in 1830. This consists of a bar of black lead grooved on one side. In this groove is placed a bar of platinum, one end of which bears against a shoulder in the groove, and the other end against a porcelain slip, called the index, which is free to move, but being secured to the bar of black lead by a friction band of platinum, remains in any position to which it may be forced. In using the instrument the platinum bar is adjusted to bear against the index, and a multiplying scale being applied, the position of the index is ascertained. The scale is then removed and the instrument is heated. After it has cooled the scale is again attached, and the amount of expansion of the platinum bar is denoted by the new position of the index. By observing the expansion between two known degrees of temperature a scale of degrees can be constructed. By this means Daniells determined the temperature of melted iron to be 2786°, and of a blast furnace 3300° Fahrenheit—results which agree very closely with subsequent investigations.

In Regnault's experiments he used the air thermometer for the measurement of high temperatures. This consists of a tube having a bulb at one end and being open at the other. The bulb is filled with air or any gas whose coefficient of expansion has been accurately determined, and the tube is filled with a liquid, such as mercury or water, and inserted in a vessel containing the same liquid. As the air is heated it expands, and if its temperature is raised sufficiently will expel all the liquid from the tube. Knowing the expansibility of the gas, the degree of temperature can be determined by noting the position of the liquid in the tube. Platinum is ordinarily employed for the bulb and a portion of the tube, and glass for that part which is not exposed to great heat. In the hands of a careful experimenter very accurate results can be obtained with this instrument, but it is not well adapted for general use.

Gauntlett's pyrometer consists of two tubes or rods, composed of metals having different coefficients of expansions. The tubes are secured to each other, at one end, and the other ends are left free. To the free end of one tube is attached a graduated dial plate, on the axis of which is a pointer with a pinion. The free end of the other tube carries a rack, which meshes into the pinion, and thus gives motion to the pointer when heat is applied. Within certain limits these pyrometers can be made quite accurate and durable, and they can be exposed to high temperatures for long periods without injury. They are also exceedingly sensitive—and for these reasons they have been largely introduced. If exposed for any considerable length of time to temperatures greater than that of red heat, they take a set, and no longer act efficiently. As at present constructed they can be readjusted for slight variations arising from overheat or other causes. Mr. Bailey, of England, by an ingenious device, arranges these pyrometers to indicate higher temperatures than that of red heat—graduating them experimentally by exposing them to high temperatures for a few seconds only (which does not ordinarily cause a permanent set), and then when used to indicate these high temperatures, they are to be exposed for the same period of time.

There are at present three methods in use, among manufacturers and others, to determine high temperatures, such as those of furnaces and molten metals, which are worthy of being described somewhat in detail.

Prinsep's method, improved by Plattner, is based on observations of the melting points of alloys, the melting points of the metals of which they are composed having been accurately determined. Silver, gold and platinum were recommended as the metals to be used in making the alloys, since they could easily be obtained in a comparatively pure state. In practice, however, it was found that silver absorbed oxygen during fusion, which disturbed its melting point—so alloys of gold and platinum are ordinarily employed. A cupel made of some refractory material is used, containing a number of minute cells, in which different alloys are placed, and by observing which alloys are fused, and which retain their solid state, the temperature is given by the following equation:

A = temperature of fusion of first metal.
B = temperature of fusion of second metal.
s = per cent., by weight, of first metal in the alloy.
S = per cent., by weight, of second metal in the alloy.
x = temperature of fusion of the alloy.
$X = A \times s + B \times S$.

There are some practical difficulties in the application of this method. In many situations it is hard to observe just when the alloy melts, and it has been found that the same alloys do not always melt at the same temperature, under precisely similar circumstances. Hence a number of observations are necessary to insure accuracy. As an illustration of the rule, we will give the result of an experiment at a furnace in Sevres. An alloy composed of 53 parts of platinum and 47 parts of gold, placed in the furnace, was thoroughly melted, while an alloy of 54 parts of platinum and 46 of gold was just beginning to soften. The melting point of platinum is 4591°, and of gold 2016°; and applying the rule, we find the temperature of the furnace to have been between

$$0{\cdot}53 \times 4591^\circ + 0{\cdot}47 \times 2016^\circ = 3381^\circ$$

and

$$0{\cdot}54 \times 4591^\circ + 0{\cdot}46 \times 2016^\circ = 3407^\circ$$

The method employed by Clement, Desormes and Schwartz, and afterward improved by Wilson, is based upon the different specific heat of bodies. A small copper cylinder containing water is used. This cylinder is surrounded by a casing of non-conducting material, and this latter by an air casing, for the purpose of preventing the escape of heat from the interior. A sensitive mercurial thermometer is placed in the water. This thermometer is fitted with a sliding scale, which is moved up when the mercury expands, and retains its position when the temperature falls. A small piece of platinum or fire clay, in the form of a cylinder or ball, is put into the water, and the position of the sliding scale is noted. (Platinum is generally employed for measuring the temperature of furnaces, and fire clay for molten metals, since platinum forms alloys if brought in contact with fused metals.) The ball is then heated, and plunged into the water, and the new reading of the thermometer is taken, by observing the position of the sliding scale, when the required temperature can be obtained by the equation given below.

Q = the weight of water.
P = the weight of the ball.
s = the specific heat of the ball.
t = original temperature of the water.
T = final temperature of the water.
X = required temperature.
Then

$$X = Q \times (T - t) + (P \times s) + T$$

There are several corrections to be applied, the nature of which will now be explained. The heat imparted by the ball to the water does not measure its total temperature, some of the heat being absorbed by the mercury of the thermometer, by the glass of the same, and by the vessel containing the water, and some remaining in the ball. It will be convenient to apply these corrections, by adding an equivalent quantity of water to the actual quantity employed.

Let W = corrected weight of water.

Then $W = Q$ + weight of mercury × specific heat of mercury + weight of glass × specific heat of glass + weight of containing vessel × specific heat of material + weight of ball × specific heat of ball; and the corrected formula for the temperature will be:

$$X = W \times (T - t) + (P \times s) + T.$$

An example will be given to illustrate this method:

Suppose a ball of platinum weighing 1000 grains is immersed in 2000 grains of water, the thermometer indicating 70°. Let the ball be then heated and immersed in the water, when the thermometer will indicate 97°. Suppose that the weight of the mercury in the thermometer is 150 grains; of the glass, 40 grains; and of the copper vessel, 800 grains, the specific heats of these materials being respectively, 0·033, 0·198 and 0·0952. The specific heat of the platinum ball is 0·0324, and applying the rules, we find:

$W = 2000 + 150 \times 0{\cdot}033 + 40 \times 0{\cdot}198 + 800 \times 0{\cdot}0952 + 1000 \times 0{\cdot}0324 = 2121{\cdot}43$ grains; and

$X = 2121{\cdot}43 \times (97 - 70) + (1000 \times 0{\cdot}0324) + 97 = 1865°$.

From this we see that one degree on the thermometric scale corresponds to $1865 \div 27 = 69$ pyrometrical degrees.

In practice it will be found convenient to graduate the pyrometrical scale by experiment, noting the rise of the thermometer after the ball is heated in something whose temperature is known. Suppose, for instance, that a ball of fire clay is used, and that it is plunged into molten lead, silver and gold, whose melting points are respectively 630°, 1873° and 2016°. If the temperature of the water were 70° before each experiment, and after the three experiments, 81°·1, 102°·5 and 105°·3, respectively, it would indicate that one degree of the thermometer corresponded to $(560° \div 10{\cdot}1 + 1803° \div 32{\cdot}4 + 1946° \div 35{\cdot}3) \div 3 = 56$ pyrometrical degrees. Having thus ascertained the graduation, the instrument can be used for determining any other temperature, it only being necessary to multiply the degrees of heat imparted to the water in any case by 56.

We have described this method of measuring high temperatures at some length, because it is very convenient and quite accurate when carefully performed. In its use it is requisite to withdraw the heated ball from the heating medium and plunge it into the water as quickly as possible, and it might be well to inclose it in some good non-conductor before withdrawal.

Siemens' pyrometer, with a description of which we will conclude our article, is constructed on the principle that the pure metals offer an increased resistance to the passage of a current of electricity with increase of temperature. It is found that the resistance is about four times as much, at a temperature of 3000° Fahrenheit as at 32°. The resistance does not increase uniformly, but follows a parabolic law, which has been accurately verified by experiment as high as about 1800°. Beyond that point, although the curve is pretty clearly defined, more experimental research seems desirable. The equation of the curve, calling R the resistance, T the temperature, and A, B and C constants determined by experiment, is

$$R = A \times \sqrt{T} + B \times T + C$$

The apparatus consists of a platinum wire encased in a metallic tube, and wound upon a piece of fire clay, upon a helical groove. This is placed in the medium whose temperature is to be determined, and the ends of the wire terminate in a measuring instrument placed in any convenient position, and not exposed to the high temperature. An electrical current, generated by a small battery, is passed through the wire and the measuring instrument, deflecting a galvanometer needle, and giving a reading on a large scale. A table, which accompanies every instrument, gives the temperature at once from the reading of the scale.

This pyrometer can be permanently attached in any place where the temperature is not excessive, and a continuous record can be kept; but it should only be exposed to furnace heat for a short time, or the wire will become deteriorated.

Siemens' pyrometer is believed to be the most accurate instrument yet invented that is generally available for the measurement of high temperatures. It will readily be perceived, however, that great care must be taken in the use of this apparatus, as well as with the others described, to insure precision; and the field is yet open for the invention of a pyrometer that can be placed in any situation of which we wish to measure the temperature, and will give reliable results without further precaution—in fact, an instrument that will occupy the same place in the furnace as a carefully constructed gauge does in the steam pipe. We have shown, however, that the desired result can be obtained, and how it can be obtained. The subject is one of much importance in many branches of industry, and we hope that these remarks will prove both interesting and instructive.

An English exchange describes a new process of coating metallic articles with tin, zinc, &c., as follows: In coating with tin, according to this invention, oil or fat, together with chloride of zinc, are placed in a heating pot having a rotary or oscillatory motion, and when the fat or oil is sufficiently heated the pins and metallic tin are thrown into the pot, which is turned or oscillated for a few seconds. The pins are thereby coated with tin, and are raked out of the pot into a vibrating riddle or sieve, through which they fall into water. Or a tubular heating pot may be used, the pins being introduced at one end and removed at the other end, the pins being carried through the rotating pot by a screw-like motion effected by a screw-like rib in the interior of the pot.

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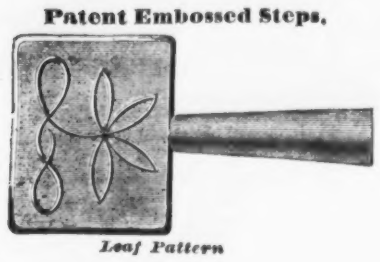

Leaf Pattern

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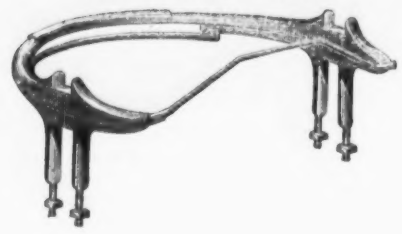
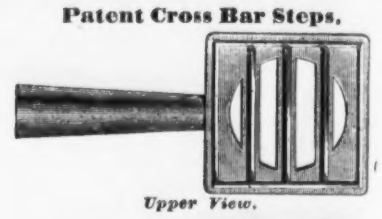
No. 6 Fifth Wheels.



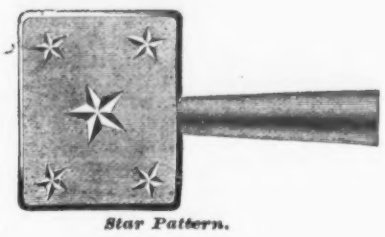
1871 Pattern Shaft Couplings.

Patent Cross Bar Steps.



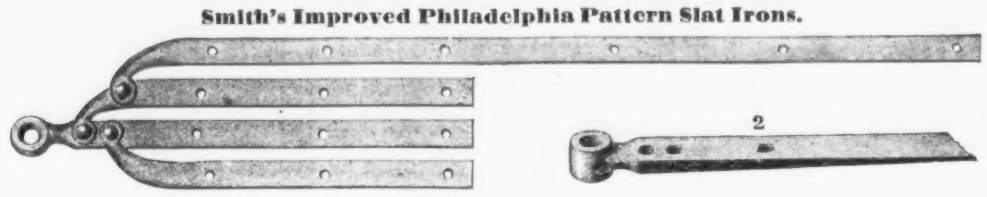
Upper View.

Lower View.

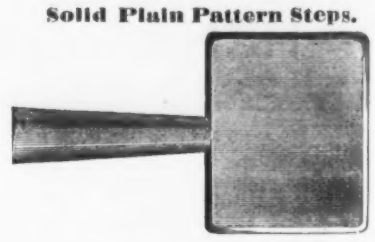


Star Pattern.

Smith's Improved Philadelphia Pattern Slat Irons.



Solid Plain Pattern Steps.



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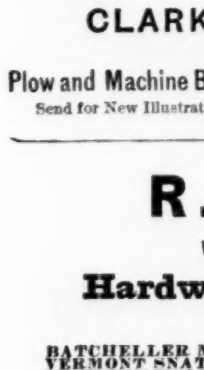

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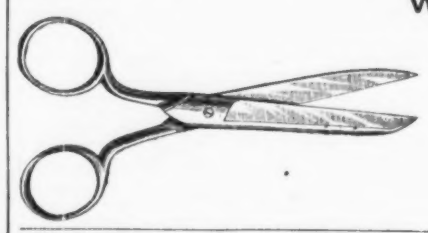

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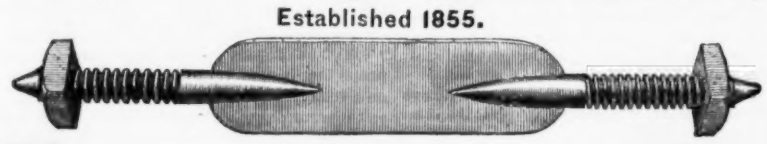

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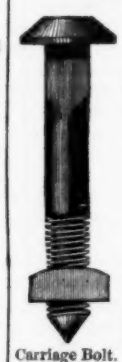

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Drilling Machines, *Makers of.*
Miller Falls Co., 78 Beekman, N. Y.....25
Thorne & DeHaven, Philadelphia.....34

Dynamometers.
Prosser Thomas & Son, 15 Gold, N. Y.....25

Edge Tools, *Makers of.*
Bradley G. W., 37 Chambers, N. Y.....8

Elevators, *Makers of.*
Otis Bros. & Co., 348 Broadway, N. Y.....9

Emery Wheels, *Makers of.*
The Union Stone Co., 16 Exchange, Boston.....8

Engineers, Machinists, etc.
Henshall James, 1056 Beach, Phila.....35
James Moore, cor. 19th and Buttonwood, Phila.....35
Tawn & Hartman, 1235 N. Front, Phila.....35

Engines, Steam, *Makers of.*
Fishkill Landing Mch. Co., Fishkill-on-the-Hudson, N. Y.....34
New York Steam Engine Co., 98 Chambers, N. Y.....35
Paulding, Kemble & Co., 30 Broadway, N. Y.....25
Whitehill, Smith & Hampson, Newburgh, N. Y.....29
Wright J. W., 112 Spruce, Phila.....35
Yale Iron Works, New Haven, Conn.....35

Engravers, *Wood.*
Patterson Jas. S., 21 Spruce, N. Y.....16
Roberts Wm., 36 Beekman, N. Y.....32
Tuttle, D. H., 5 Beekman, N. Y.....16

Eyelets.
Union Eyelet Co., Providence, R. I.....3

Faucets, *Self-Measuring, Makers of.*
Enterprise Mfg. Co., of Pa., Phila. and N. Y.....30

Files, *Importers of.*
Carr J. & Riley 82 John, N. Y.....32
Dickinson Henry, 66 and 68 Reade, N. Y.....11
Fisher Joseph S., 411 Commerce, Phila.....11
Frasse Peter A. & Co., 26 Fulton, N. Y.....8
Romer Foot & Co., Springfield, Mass.....9
Moss F. W., 80 John, N. Y.....32
Sanderson Bros. & Co., 16 Cliff, N. Y.....32
Spear & Jackson, 98 Chambers, N. Y.....26

Files, *Manufacturers of.*
Barnett G. & H., 41 and 43 Richmond, Phila.....8
McCaffrey & Bro., 1732 and 1734 N. 4th, Phila.....8
Nicholson File Co., Providence, R. I.....8
Wheeler, Clemson & Co., Middletown, N. Y.....10

Fire Arms, *Manufacturers of.*
Robinson M. W., 79 Chambers, N. Y.....13
Schoverling & Daly, 84 Chambers, N. Y.....13
Spies, Kissam & Co., 279 Broadway.....13

Fire Brick, *Makers of.*
Hall A. & Sons, Perth Amboy, N. J.....24
Kreischer B. & Son, 58 Goerck, N. Y.....24
Newkumet Philip, 23d and Vine, Phila.....24
Palmer, Newton & Co., Albany, N. Y.....24
Watson John R., Perth Amboy, N. J.....24

Flint and Emery Paper and Cloth.
Cowdin Mfg. Co., 115 Chambers, N. Y.....30

Fluting Machines, *Makers of.*
Lowerre & Tucker, Newark, N. J.....34

Gage Cocks and Damper Regulators.
Murrill & Kelzer, Baltimore, Md.....35

Galvanized Iron.
Lefferts Marshall Jr., 94 Beekman, N. Y.....4

Glass, *Importers of.*
Downing A. C. & Co., 57 Beekman, N. Y.....28

Grindstones.
McDermott J. & Co., Cleveland, O.....9
Wood Walter R., 233 and 235 Front, N. Y.....9

Gunpowder, *Makers of.*
Kneeland F. L. (Dupont) 70 Wall, N. Y.....32
Laflin & Rand Powder Co., 21 Park Row, N. Y.....32

Hammers, etc., *Manufacturers of.*
Emmet Hammer Co., Brooklyn, E. D., N. Y.....25
Hammond C. & Son, 13 N. 5th, Phila.....25
Minot & Co., Oliver, Boston.....25
Nelson Tool Works, 157 E. 32d, N. Y.....18

Hardware, *Brass and Galvanized.*
Tiebout W. & J., 290 Pearl, N. Y.....2

Hardware, Commission Merchants.
Fernald & Sise, 100 Chambers, N. Y.....8
Green R. M., 100 Chambers, N. Y.....12
Graham & Haines, 98 Chambers, N. Y.....30
Halsey J. E., 76 Reade, N. Y.....30
Walbridge Geo. B., 55 Chambers, N. Y.....16

Hardware Dealers.
Finney Thos. I. & Co., Vicksburg, Miss.....8
Lloyd, Supplee & Walton, 625 Market, Phila.....14
Louderback, Gilbert & Co., 53 Chambers, N. Y.....18
Shepard Sidney & Co., Buffalo, N. Y.....25
Turner, Seymour & Judds, 64 Duane, N. Y.....8

Hardware Importers.
Beaun & Murray, 54 Cliff, N. Y.....26
Boker Hermann & Co., 101 Duane, N. Y.....26
Field Alfred & Co., 47 John, N. Y.....12
Hilger & Sons, 87 Chambers, N. Y.....26
King H. & J. W., 80 Chambers, N. Y.....11
E. Frith, 16 Cliff, N. Y.....8
Louderback, Gilbert & Co., 53 Chambers, N. Y.....18
Many F. L. & Marshall, 48 Warren, N. Y.....30
Middletown Tool Co., 82 Chambers, N. Y.....28
Miller's Falls Mfg. Co., 78 Beekman, N. Y.....25
Pratt & Co., Buffalo, N. Y.....25
Providence Tool Co., 11 Warren, N. Y.....14
Russell & Erwin Mfg. Co., 45 Chambers, N. Y.....14
Schweitzer Mfg. Co., 57 Reade, N. Y.....16
Shattuck W. F. & Co., 113 Chambers, N. Y.....8
Stanley Works, 58 Beekman, N. Y.....26
Taylor Mfg. Co., New Britain, Conn.....24
Turner, Seymour & Judds, 64 Duane, N. Y.....8
Union Mfg. Co., 55 Chambers, N. Y.....5
Williams, White & Churchill, 73 Warren, N. Y.....37
Wilson Mfg. Co., 37 Chambers, N. Y.....25

Hardware Specialties.
Biddle Mfg. Co., 78 Chambers, N. Y.....28
Haase John A., rear 116 Vanhorn, Phila.....16
Louderback, Gilbert & Co., 53 Chambers, N. Y.....18
Semple, Birge & Co., St. Louis.....36

Helve Hammers, *Makers of.*
Bradley Mfg. Co., Syracuse, N. Y.....29

Hoisting Engines, *Makers of.*
Otis Bros. & Co., 348 Broadway, N. Y.....9

Horse Hay Forks and Fixtures, *Makers of.*
Neills A. J. & Co., Pittsburgh, Pa.....36

Horse Nails, *Makers of.*
Ausable Horse Nail Co., 35 Chambers, N. Y.....36
Brundage & Co., Middletown, N. Y.....10
Globe Nail Co., Boston, Mass.....36
Pratt & Co., Buffalo, N. Y.....16
Putnam S. & Co., Neponset, Mass.....8

Horse Shoes, *Makers of.*
Burden Iron Works, Troy, N. Y.....4

Hubs and Spokes, *Mfrs. of.*
Gleason J., 2nd and Diamond, Phila.....12

Hydraulic Jacks.
Dudgeon Richard, 24 Columbia, N. Y.....28

Ice Cream Freezers, *Makers of.*
Torry E. S. & J., 166 Fulton, N. Y.....24

Insurance, Boiler.
Hartford Steam Boiler and Inspection Co.....29

Iron Brokers.
Boynton Geo. A., 70 Wall, N. Y.....6
Hazard & Jones, 212 Pearl, N. Y.....4
Petit Wm. H., 72 Wall, N. Y.....4

Iron, Corrugated, *Manufacturers of.*
Corrugated Metal Co., East Berlin, Conn.....4

Iron, Charcoal, *Warm or Cold Blast.*
Quincy John W., 98 William, N. Y.....4

Iron Commission Merchants.
Blakiston & Cox, 333 Walnut, Phila.....7
Hand Jas. C. & Co., 614 and 616 Market, Phila.....8
Hoopes W. Graham, 419 Walnut, Phila.....7
Malin Bros., 228 Dock, Phila.....7

Iron, Pig, *Importers of.*
Williamson James & Co., 69 Wall, N. Y.....4

Iron Dealers.
Abeel Brothers, 190 South, N. Y.....4
Bonnell, Botsford & Co., Youngstown, O.....4
Borden & Lovell, 70 and 71 West, N. Y.....4
Cleveland, Brown & Co., Cleveland, O.....6
Coddington T. B. & Co., 25 Cliff, N. Y.....4
Conklin & Huerstel, 99 Market Slip, N. Y.....4
Fuller, Lord & Co., 139 Greenwich, N. Y.....4
Fuller, Dana & Fitz, 110 North, Boston.....2
Gardner Wm., 575 Grand, N. Y.....4
Hall, Kimbark & Co., Chicago.....6
Harrison & Gillison, 586 to 562 Water, N. Y.....4
Hart E. R. & G. A., 206 Walnut, Phila.....7
Jackson & Chase, 206 and 208 Franklin, N. Y.....4
Judson B. F., 457 and 459 Water, N. Y.....4
Matthews Chas. W., 133 Walnut, Phila.....7
Packard, Goff & Co., Youngstown, O.....4
Pettee & Mann, 228 and 229 South, N. Y.....4
Piersons & Co., 24 Broadway, N. Y.....4
Pope Thos. J. & Bro., 292 Pearl, N. Y.....6
Quincy John W., 98 William, N. Y.....4
Richards D. W. & Co., 92 Mangin St., N. Y.....4
Smith Gam'l G. & Co., 342 Pearl, N. Y.....4
Warner A. B. & Sons, 28 and 29 West, N. Y.....4
Williamson James & Co., 69 Wall, N. Y.....4
Whitney Alfred R., 58 Hudson, N. Y.....4

Iron, Manufacturers of.
Cushong & Co., 31 Beekman, N. Y.....4
Britannia Iron Works, Middlesbro', Eng.....6
Burden Iron Works, Troy, N. Y.....4
Cleveland Rolling Mill Co., Cleveland, O.....6
Coffin Wm. E. & Co., 8 Oliver, Boston.....4
Ellis W. R. & Co., 17 Battery march, Boston.....4
Everson, Graff & Macrum, Pittsburgh, Pa.....4
Fulton S. & Co., 412 Walnut, Phila.....7
Jones & Laughlins, Pittsburgh, Pa.....4
Leonard John, 450 & 451 West st., N. Y.....4
Lynchburg Iron Works, Lynchburg, Va.....4
Milwaukee Iron Co., Milwaukee, Wis.....6
Niles Iron Co., Niles, O.....6
New Haven Rolling Mill Co., New Haven, Ct.....6
Old Dominion Iron & Nail Works Co., Richmond, Va.....6
Oxford Iron Co., 81 Washington, N. Y.....4
Phœnix Iron Co., 410 Walnut, Phila.....
Rowland Wm. & Harvey, Phila.....36

Iron, Hoop, *Manufacturers of.*
Wm. Clark & Co., Pittsburgh, Pa.....4

Iron, Swedish, *Importers of.*
Jessop Wm. & Sons, 91 and 93 John, N. Y.....32
Mitander Nils, 69 William, N. Y.....4
Page Ewd. & Co., Boston, N. Y. and Phila.....4

Lace Leather, *Manufacturers of.*
Stoyle Wm. H., 403 Library, Phila.....6

Lanterns, *Manufacturers of.*
Dietz, R. E., (Tubular) 54 and 56 Fulton, N. Y.....36
Howard & Morse, 45 Fulton, N. Y.....2

Lawn Mowers, *Manufacturers of.*
Chadborn & Coldwell Mfg. Co., Newburgh, N. Y.....29

Lead and Tin Lined Lead Pipe, etc., *Mfrs.*
Colwell Lead Co., 213 Centre, N. Y.....2

Locks, *Manufacturers of.*
Bohannan Wilson, Broadway and Kossuth, Brooklyn, E. D.....3
Branford Lock Works, Branford, Conn.....12
Norwich Lock Co., Norwich, Conn.....36
Romer & Co., Newark, N. J.....3
Sargent, Greenleaf & Cole, 300 Broadway, N. Y.....24
Trenton Lock Co., 48 Warren, N. Y.....30
Yale Lock Mfg. Co., 298 Broadway, N. Y.....16

Machinery, *Makers of.*
Billings & Spencer Co., Hartford, Conn.....16
Fishkill Landing Mch. Co., 63 Beecker, N. Y.....34
Gear A. S., 56 to 62 Sudbury, Boston.....34
Mason V. W. & Co., Providence, R. I.....34
Chapin Machine Co. New Hartford, Conn.....12
Paulding, Kemble & Co., 30 Broadway, N. Y.....9
Pratt & Whitney Co., Hartford, Conn.....34
Rollstone Machine Works, Fitchburg, Mass.....35
Sellers Wm. & Co., 1600 Hamilton, Phila.....34
Watson Andrew, 537 Dickinson, Phila.....35
Whitehill, Smith & Co., Newburgh, N. Y.....28

Machine Screws, *Makers of.*
Lyon & Fellows Mfg. Co., Williamsburg, N. Y.....16

Machinists.
Demarest, Joyce & Co., Brooklyn, E. D.....9
Ellis T. & Bro., 2338 Court, Phila.....6

Machinists' Tools, *Makers of.*
Blaisdell P. & Co., Worcester, Mass.....35
Blundell Henry & Co., Providence, R. I.....35
Freeland Tool Works, 558 & 560 W. 34th, N. Y.....35
Harrington Edwin, 152a st. and Pa. ave., Phila.....35
Lincoln Geo. S. & Co., Hartford, Ct.....34
Star Tool Co., Providence, R. I.....13

Meat Cutters, *Makers of.*
Newton D. A. & Co., 106 Chambers, N. Y.....
Vulcan Mfg. Co., 61 Warren, N. Y.....15
Whittemore D. H., Worcester, Mass.....16

Metal Dealers and Brokers.
Coddington T. B. & Co., 25 and 27 Cliff, N. Y.....2
Cragin Bros. & Co., 141-3 Lake, Chicago, Ill.....2
Crane U. O., 104 John, N. Y.....2
Harnickel Max, 85 Beaver, N. Y.....2
Phelps, Dodge & Co., Cliff, bet. John & Fulton, N. Y.....2
Pope Thos. J. & Bro., 292 Pearl, N. Y.....2
Quincy J. W., 98 William, N. Y.....2
Thomson A. A. & Co., 213 and 215 Water, N. Y.....2
Van Wart & McCoy, 43 Chambers, N. Y.....2

Metallurgists.
Britton J. Blodgett, 339 Walnut, Phila.....14
Drown Thomas M., 1123 Girard, Phila.....14
Henderson James, 20 Broadway, N. Y.....14
Maynard & Van Rensselaer, 24 Cliff, N. Y.....14
School of Mines, E. 49th, N. Y.....14

Mining and Railroad Tools, &c., *Makers of.*
Washoe Tool Mfg. Co., 61 Park Place, N. Y.....10

Molders' Tools.
Carter H. & Sons, 290 Pearl, N. Y.....26

Monuments, *Granite and Bronze.*
National Fine Art Foundry, 218 E. 25th.....6

Mouse Traps, Catchemalive, *Makers of.*
Dietz R. E., 54 and 56 Fulton, N. Y.....36

Nickel Platers.
Smith L. A., 42 Mechanic st., Newark, N. J.....31

Norway Shapes, *Rollers of.*
Rowland Wm. & Harvey, 948 Beach, Phila.....36

Note Broker.
Gallaudet P. W., 3 and 5 Wall, N. Y.....2

Nuts, Bolts, etc., *Makers of.*
Ætna Nut Co., Southington, Conn.....14
Arms, Bell & Co., Youngstown, O.....14
Carpenter David, 402 Water, N. Y.....4
Clark Bros. & Co., Millsdale, Conn.....12
Fuller, Lord & Co., Boonton, N. J.....4
Haskell W. H. & Co., Pawtucket, R. I.....14
Lewis, Oliver & Phillips, Pittsburgh and N. Y.....14
Plumb, Burdict & Barnard, Buffalo, N. Y.....36
Rhode Island Nut Co., 11 Warren, N. Y.....14
Sternbergh J. H., Reading, Pa.....14

Oilers, *Makers of.*
White J. H., Newark, N. J.....3

Ore Crushing Machines, *Makers of.*
Blake Crusher Co., New Haven, Conn.....34

Paints and Oils, *Dealers in.*
Devoe F. W. & Co., 117 Fulton, N. Y.....

Patent Adjustable Elbows.
Sargent, Greenleaf & Cole, 300 Broadway, N. Y.....13

Patent Solicitors.
Howson & Son, Phila. and Washington, D. C.....33
Leggett & Leggett, Washington, D. C.....8
Whitney J. A., 128 Broadway, N. Y.....33

Picture Nails, etc., *Manufacturers of.*
Richards T. C. & Co., 47 Murray, N. Y.....3

Pipes, Fittings, etc., *Makers of.*
Eaton & Cole, 58 John, N. Y.....16
McNab & Harlin Mfg. Co., 56 John, N. Y.....16
Nelson, Finkel & Co., 439 E. 10th st., N. Y.....16
Pancoast & Maule, 227 Pear, Phila.....16
Chas. Gregg Mfg. Co., 62 and 64 Gold, N. Y.....16

Pipe, Water and Gas, *Makers of.*
Brick R. A. & Co., 112 Leonard, N. Y.....6
Graff William & Co., Pittsburgh, Pa.....16
Morris, Tasker & Co., 15 Gold, N. Y.....16
National Tube Works Co., 78 William, N. Y.....16
Starr Jesse W. & Sons, Camden, N. J.....6
Warren Foundry & Mach. Co., Phillipsburg, N. J.....16
Wood R. D. & Co., 173 Broadway, N. Y.....6

Plane Irons, *Manufacturers of.*
Middletown Tool Co., Middletown, Conn.....28
Sandusky Tool Co., Sandusky, O.....31

Planes, *Manufacturers of.*
Greenfield Tool Co., Greenfield, Mass.....8
Sandusky Tool Co., Sandusky, O.....30
Stanley Rule & Level Co., 55 Chambers, N. Y.....8

Plumbago Lubricator.
N. Y. Black Lead Works, 172 Forsyth, N. Y.....39

Plumbers' Materials, *Manufacturers of.*
Carr Wm. S. & Co., 106 Centre, N. Y.....15

Presses, Power, *Makers of.*
Am. Saw Co., 1 Ferry, N. Y.....36
Peck Milo & Co., New Haven, Ct.....23
The Stiles & Parker Press Co., Middletown, Ct.....35

Pressure Blowers, *Makers of.*
Blackburn, B. F., 11th and Hamilton, Phila.....36
Sturtevant B. F., 72 Sudbury, Boston.....35

Publishers.
Burr J. B. & Hyde, Hartford, Conn.....18

Pumps, *Makers of.*
Douglas W. & B., Middletown, Conn.....5
Ramsey & Co., Seneca Falls, N. Y.....5
Union Mfg. Co., 55 Chambers, N. Y.....5
Valley Mch. Co., Easthampton, Mass.....5

Rails, *Importers of.*
Congreve Chas. & Son, 104 and 106 John, N. Y.....32
Smith Gilead A. & Co., 62 Broadway, N. Y.....4

Rails, Iron or Steel, *Makers of.*
Atkins Bros., Pottsville, Pa.....6
Cambria Iron Co., Johnstown, Pa.....7
Cleveland Rolling Mill Co., Cleveland, O.....6
Evansville Rolling Mill Co., Evansville, Ind.....6
Griswold John A. & Co., Troy, N. Y.....34
Milwaukee Iron Co., Milwaukee, Wis.....6
Springfield Iron Co., Springfield, Ills.....4
The Cincinnati Railway Iron Works, Cincinnati, O..6
Joliet Iron & Steel Co., Joliet, Ills.....6

Razor Straps, *Makers of.*
B. F. Badger, 51 Elm, Charlestown, Mass.....30

Rolling Mill Machinery, etc., *Manufacturers of.*
Moore James, Cor. 16th and Buttonwood, Phila.....35

Rolls, Chilled and Sand, *Makers of.*
Garrison A. & Co., Pittsburgh, Pa.....4

Rules, *Manufacturers of.*
Chapin E. M., Pine Meadow, Ct.....5

Sash Chain.
Thomas Morton, 15 Murray, N. Y.....30

Saws, *Makers of.*
Atkins E. C. & Co., Indianapolis, Ind.....10
American Saw Co., 1 Ferry, N. Y.....10
Boynton E. M., 80 Beekman, N. Y.....10
Eccles James, 2423 Lombard, Phila.....10
Flint J., Rochester, N. Y.....10
Disston Henry & Sons, Phila.....10
McNeice Wm., 515 Cherry, Phila.....10
James Ohlen, Columbus, O.....10
Peace Harvey W., Williamsburg, N. Y.....10
Spear & Jackson, 116 Duane, N. Y.....26
Wheeler, Madden & Clemson, Middletown, N. Y.....10
Woodrough & McParlin, Cincinnati, O.....10
Worrall & Co., 28 Elm, N. Y.....10

Saw Frames, Wood, *Makers of.*
Peace Harvey W., Williamsburg, N. Y.....10

Scales, *Manufacturers of.*
Brandon Mfg. Co., Brandon, Vt.....9
Patterson Bros., 27 Park Row, N. Y.....36
Richle Bros., 9th near Coates, Phila.....10
Shattuck W. F. & Co., 113 Chambers, N. Y.....8

Scissors, *Manufacturers of.*
Rowe & Post, 120 Chambers, N. Y.....11
U. S. Steel Shear Co., W. Meriden, Ct.....12

Screws, *Makers of.*
Miles F. S., 205 Quarry, Phila.....26

Screws, *Importers of.*
Bruce Geo. W., 1 Platt, N. Y.....31
Field Alfred & Co., 47 John, N. Y.....12
Gueutal George, 39 W. 4th, N. Y.....10

Sewing Machines.
Wilson Sewing Machine Co., 707 Broadway, N. Y.....30

Shovels, &c.
Clement & Hawkes Mfg. Co., Northampton, Mass.....8
Sherman Nathaniel B., 81 Beekman, N. Y.....15

Smelting Works.
Du Plaine & Reeves, 760 S. Broad, Phila.....36

Skates.
Union Hardware Co., 120 Chambers, N. Y.....18

Stamped and Japanned Tin Ware.
Farrington J. D., Jr., 38 Murray, N. Y.....24
Shepard Sidney & Co., Buffalo, N. Y.....25

Steam Hammers, etc., *Makers of.*
Dudgeon Richard, 24 Columbia, N. Y.....35
Ferris & Miles, 24th and Wood, Phila.....35

Snaps, Harness. *Makers of.*
Middletown Tool Co., Middletown, Conn.....28

Speed Indicators, *Makers of.*
Connecticut Cutlery Co., Naugatuck, Conn.....31

Squares, Steel and Iron, *Makers of.*
Hart, Bliven & Mead Mfg. Co., 243 Pearl, N. Y.....9

Steam Pumps, etc., *Manufacturers of.*
Carr A, 43 Cortlandt., N. Y.....29
Hall C. Henry & Co., 20 Cortlandt, N. Y.....16
Philadelphia Hydraulic Works, Evelina street, east of Third street, Phila.....35
Woodward Steam Pump Co., 76 Centre, N. Y.....5

Steel Importers.
Carr J. & Riley, 82 John, N. Y.....32
Cocker Bros., Sheffield, England.....32
Congreve Chas. & Son, 104 and 106 John, N. Y.....32
Hobson Francis & Son, 97 John, N. Y.....32
Jessop Wm. & Sons, 91 and 93 John, N. Y.....32
Moss F. W., 80 John, N. Y.....32
Piersons & Co., 24 Broadway, N. Y.....4
Sanderson Bros. & Co., 16 Cliff, N. Y.....32
Sanderson Geo. & Co., 57 John, N. Y.....32
Van Wart & McCoy, 43 Chambers, N. Y.....32
Wardlow S. & C., 13 Gold, N. Y.....32
W. Hawksworth, Ellison & Co., 72 John, N. Y.....32

Steel Manufacturers.
Anderson & Woods, Pittsburgh.....33
Chrome Steel Co., Brooklyn, E. D.....33
Cleveland Rolling Mill Co., Cleveland, O.....5
Gautier D. G. & Co., Jersey City, N. J.....32
Griswold John A. & Co., Troy, N. Y.....32
Hussey, Wells & Co., Pittsburgh.....33
Miller, Barr & Parkin, Pittsburgh.....32
New Jersey Steel and Iron Co., Trenton, N. J.....33
Reese, Graff & Woods, Pittsburgh.....33
Reiter, Lavelly & Co., Pittsburgh.....33
Rowland Wm. & Harvey, 948 Beach, Phila.....36
Singer, Nimick & Co., Pittsburgh.....32

Stone Crushing Machines.
Blake Crusher Co., New Haven, Ct.....34

Stoves.
Resor William & Co., Cincinnati, O.....24

Stove Boards, *Manufacturers of.*
Shepard Sidney & Co., Buffalo, N. Y.....25

Stove Polish, *Makers of.*
"Gem" Stove Polish, 172 Forsyth, N. Y.....36

Twist Drills, *Makers of.*
Morse Twist Drill & Mach. Co., N. Bedford, Mass.....34

Tackle Blocks, *Makers of.*
Burr & Co., 31 Peck Slip N. Y.....4

Tacks.
American Tack Co., 117 Chambers, N. Y.....31
Field A. & Sons, Taunton, Mass.....31
Grundy & Kenworthy, 165 Greenwich, N. Y.....31
Dunbar, Hobart & Whidden, S. Abington, Mass.....31
Loring Samuel, Plymouth, Mass.....31

Tea Trays, *Importers of.*
Dickinson Henry, 66 and 68 Reade, N. Y.....11

Tinmen's Tools and Machines, *Makers of.*
Peck, Stow & Wilcox Co., 97 Chambers, N. Y.....26

Trowels, etc., *Makers of.*
Rose Wm. & Bros., 36th and Filbert, W. Phila.....40

Turbine Water Wheels, *Manufacturers of.*
Capron Water Wheel Co., Hudson, N. Y.....31
Whitehill, Smith & Co., Newburgh, N. Y.....28

Tubes, Seamless Brass and Copper, *Manufacturers of.*
Merchant & Co., 507 Market, Phila., Pa.....16

Tubes, Wrought and Galvanized, *Manufacturers of.*
Griffith I. J. & Bros., Philadelphia, Pa.....16

Tube Expanders.
Dudgeon Richard, 24 Columbia, N. Y.....28

Tuyeres, *Manufacturers of.*
Bayliss John, 157 East 54th, N. Y.....13

Valves, Gas, Water and Steam.
Ludlow Valve Mfg. Co., N. Y.....26

Vises.
Backus Vise Co., 78 Beekman, N. Y.....28
Fisher & Norris, Trenton, N. J.....25
Howard Iron Works, Buffalo, N. Y.....25
Wilson Mfg. Co., 37 Chambers N. Y.....25

White Lead, *Manufacturers of*
Brooklyn White Lead Co., 89 Malden Lane, N. Y.....9
Colgate Robert & Co., 287 Pearl, N. Y.....9
Cornell Lead Co., Buffalo, N. Y.....9
Jewett John & Sons, 182 Front, N. Y.....9
Lewis John T. & Bros., 231 S. Front, Phila., Pa.....9
Union White Lead Co., 26 Burling Slip, N. Y.....9

Wire, *Manufacturers of.*
Gilbert, Bennett & Co., 273 Pearl, N. Y.....2
New Haven Wire Co., New Haven, Conn.....2
Philadelphia Wire Works, N. 5th, Phila.....2
Prentiss Geo. W. & Co., Holyoke, Mass.....2
Townsend W. P. & Co., Pittsburgh, Pa.....4
Washburn & Moen Mfg. Co., Worcester, Mass.....2

Wire Goods, *Manufacturers of.*
Andrews A. R. & Co., Hartford, Conn.....2
Chicago Wire Cloth Mill, Chicago, Ill.....2
Gilbert, Bennett & Co., 273 Pearl, N. Y.....2
Howard & Morse, 45 Fulton, N. Y.....2
Hopkins A. W., West Broadway, N. Y.....2
Howe, Bigelow & Co., Worcester, Mass.....2
Parker Sam'l & Co., Wethersfield, Ct.....2

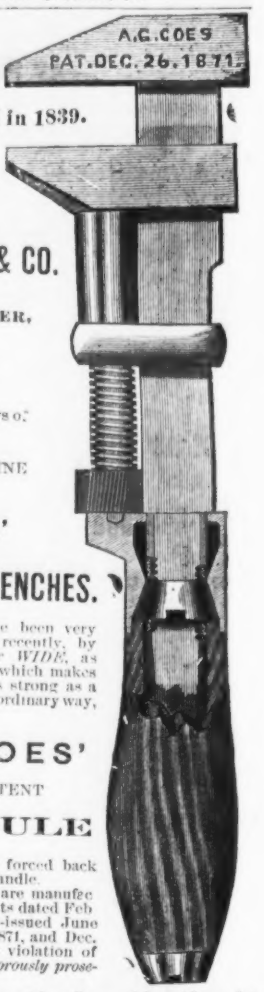
Wire Rope, Iron and Steel, *Makers of.*
Roebling's John A. Sons, Trenton, N. J.....2

Wood Working Machinery, *Makers of.*
S. A. Woods Machine Co., 91 Liberty, N. Y.....36

Wrenches, *Manufacturers of.*
Coes A. G. & Co., Worcester, Mass.....13
Coes L. & Co., Worcester, Mass.....28
Philadelphia Tool Co., Phila.....12

Wrought Iron Goods, *Maker of.*
Maguire Jas. T., 115 Chambers, N. Y.....5

Hardware.



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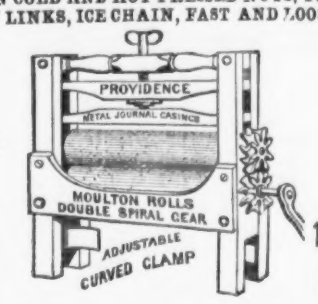

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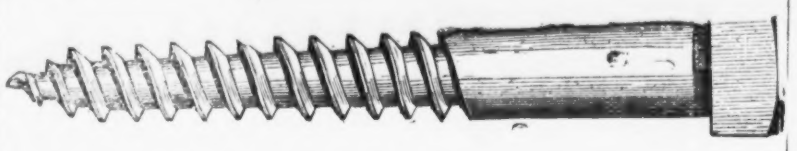

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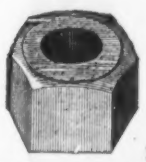

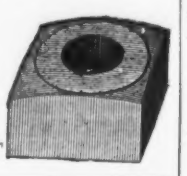

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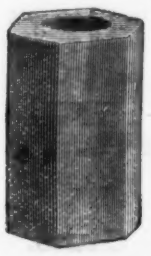

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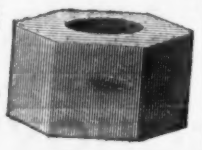

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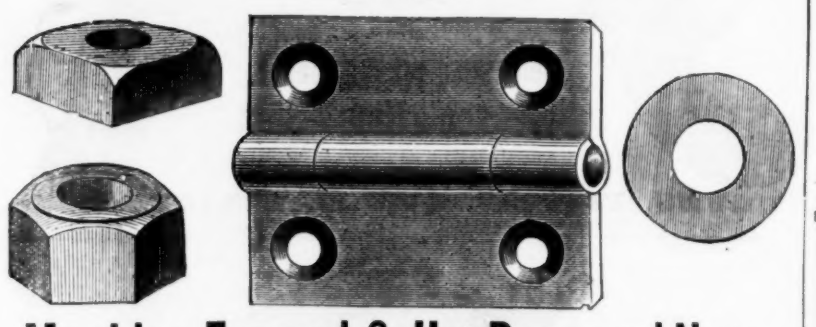

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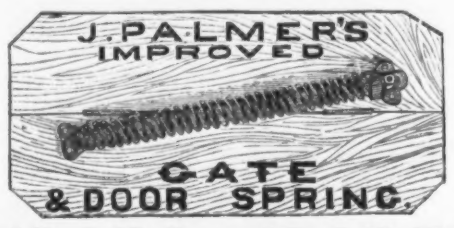

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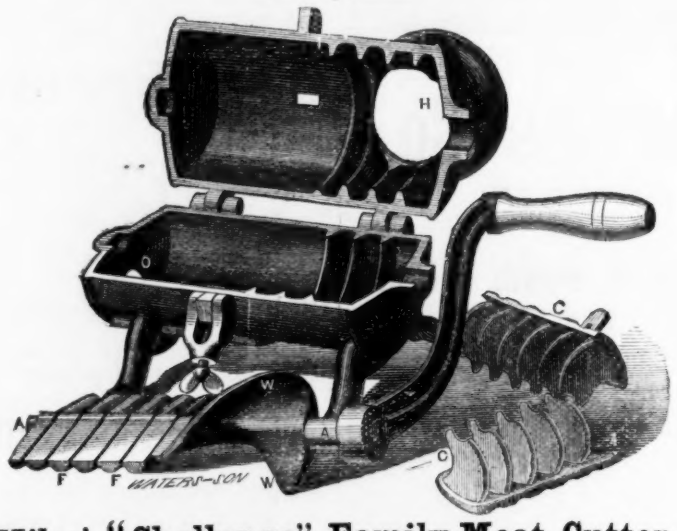

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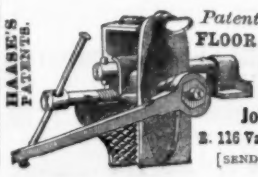

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Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(*From our Regular Correspondent.*)

SHEFFIELD, Eng., August 26, 1873.

The Iron and Steel Institute had no inconsiderable amount of feting during its brief visit to Belgium, and I am disposed to note that Artemus Ward's business maxim, "Scratch my back and ile scratch your'n," was pretty perseveringly borne in mind. It must, nevertheless, be conceded that Mr. Bell's address, a full copy of which you will have received from me, was characterized by its evidences of great care in compilation, and by the thorough, practical knowledge of his subject from beginning to end. The reply of M. Trasenster was polite, polished, and withal a little enthusiastic. I had expected to find some really useful official or general statistics as to the rise and progress of Belgic metallurgy and mining, with a passing glance at the existing state of the labor question in Belgium, and in the contiguous parts of the Continent, together with something tangible as to the probable results of the somewhat keen competition between the iron masters of the two nations. Instead of this we find M. Trasenster uttering periods of this laudatory nature:

"You have watched the emancipation of Belgium with an interest equally alive at all times. Documents recently brought to light have furnished the proof that subsequent to 1830 it was your country alone that has been constantly protecting us against the greediness and political enmity of neighboring powers. On various occasions, and especially at the time when the important Luxembourg and railway questions were agitated, and more recently still, when two great Continental nations were engaged in one of the most formidable duels known in history, England has shielded us, nay, if need be, she would have flung the weight of her guns into the scales for the preservation of a small independent nation that rejoices in such independence, from the consequences of criminal plans that might have been brought into play against it."

This, it may be conceded, is all very well from an after-dinner point of view, but compared with Mr. Bell's formidable array of facts and figures, it appears but to poor advantage. I think M. Trasenster's imagination got the better of his experience when he thus alludes to Japan, and particularly to China:

"In the far East we see Japan wake as though from a long slumber, and go in quest of new elements of regeneration in its contact with European nations.

"Nearest to Japan we find an empire, more populous of itself than all Europe put together, which had hitherto opposed all innovation from abroad with a sort of ferocious and obstinate distrust. This distrust seems on the wane now, and if our proceedings toward China be tempered by a due regard and great circumspection, we may be able to remove the obstacles altogether, and open to our industry a considerable market.

"In order to take the right step in the proper direction, an ingenious idea has taken body in England. A wedding present to the amount of a million and a half francs has been raised by subscription to be handed over to the youthful Emperor. The amount was furnished by the great industrial men of England, with a view of familiarizing an ignorant and timid, though hard-working, people with the great European inventions. The gift consists of a complete railway line, with locomotives, cars, &c., in order to practically demonstrate to him the superiority of railway transportation."

The English exhibitors mustered in pretty fair force, and quite outshone our friends, *les Belgiques*. Of the Belgians the Societe John Cockerill were chief. The first paper read was one by Mons. Rene Malherbes, Ingenieur du Corps des Mines, on "The Geology of Belgium," and was exhaustive, but provoked no discussion. The next was by Mons. Julien Deby, C. E., on the "Rise and Progress of the Iron and Steel Industries of Belgium," followed by Mr. Charles Wood (engineer of the Tees Iron Works, Middlesboro), on the "Economical Preparation of Iron for the Danks' Puddling Furnace." These were of considerable interest. Several other papers were read, and a number of the principal works were visited. The members proceeded by steamer up the Meuse to Kinkempois, where they landed and proceeded to the steel manufactories of Anglem, Esperance, Marinaque and Schlessin. Next day the Cockerill works, at Seraing, were visited, and before the break up of the Congress it was decided to meet next year in Philadelphia, and in 1875 in England. There are, as a matter of course, differences of opinion as to the propriety or usefulness of meetings of the Institute outside the United Kingdom. One of the opinions held is fairly set forth in the following extract from *Iron*, a London publication: "We think such occasional foreign visits and meetings may very fairly be grafted upon the proceedings of the Society, but rather as supplementary to, than as superseding, its ordinary meetings. Otherwise the Institute may find themselves engaged in a doubtless interesting, but certainly costly and troublesome, perhaps needless, 'survey of mankind from China to Peru,' from their own particular industrial standpoint. There are, in fact, no limits to such a discursive tendency: Sweden, Russia, Spain, America, Australia, New Zealand, possibly Japan and the Fiji Islands, may claim attention in turn; and, indeed, we note already an invite from an American source for a visit next year to Pittsburgh or Philadelphia, which, we are surprised to learn, has been accepted. The line must be drawn somewhere, and there is obviously all the difference between sending out to America a Commission of three members to enquire and report on the Danks' Patent Rotary Puddling Furnace—even though the same results might easily have been obtained in this country a few months later—and the Institute transferring itself bodily, so to say, across the Atlantic for an autumn industrial campaign. A journey across the sea, implying a ten or twelve days' passage out, and the same home, involving three weeks or a month in mere transit, is one thing; a pleasant common holiday trip of ten or twelve hours out, and the same home, is quite another.

"Finally, we think a distinction might fairly be made between an English Institution holding a meeting abroad, and the similar meetings of kindred societies abroad; as, also, between the technical discourses and communications of the English and Foreign members and contributors. The latter might well be received in their native language, and translated subsequently for publication; but we regard it as a *sine qua non* that the proceedings of an English Society should be in English. However flattering it may be to foreign entertainers of such unbounded hospitality, and however facile it may be for a fluent and accomplished linguist to give an address or paper in French, the possibility of such a practice becoming a precedent opens up an appalling vista for presidents *in posse*. The United States might present no difficulty; but imagine the necessity of preparing and delivering a technical address or paper, say even in German; at which even members of the Iron and Steel Institute, all possible presidents, might well crane; to say nothing of the prospect of performing the same linguistic feat in fluent Spanish, Scandinavian, Sclave, or Russian—at which they would assuredly stand aghast. While complimenting Mr. Bell upon his capabilities, we think he has had the best and easiest task of it, and that his successors, whoever they may be, will come to regard the custom and example he has set them as one "more honored in the breach than the observance.'"

There is some truth in these remarks, although they deal with possibilities rather than probabilities, seeing that there is no rule of the Institute providing for meetings out of the kingdom. The several papers read you will no doubt reproduce. They therefore will need no comment on my part beyond a recommendation to your readers that they peruse carefully that of Herr Franz Buttgenbach's (Heus Hutte, Prussia) on the method of constructing Blast Furnaces, carried out by him with much success.

The lockout in the engineering and iron trade which had been commenced in the Manchester, Bolton, &c., districts, has been partially averted, the Amalgamated Society of Engineers having proposed that the question in dispute should be referred to arbitration. The suggestion has been assented to on the part of the employers and an arbitrator has been appointed. The difficulties in South Wales on the colliers weighing question are gradually being surmounted, but on the other hand it is stated that the whole of the coal owners of South Wales have formed an association, strongly knit together, which will probably act with the Iron Masters' Association in all cases where concerted action is needed to check the pretensions or action of the Trades' Unions or workmen generally. Beside these there are many minor labor disputes, the number and frequency of which clearly demonstrate the unpleasant fact that the relations between capital and labor are by no means of the most amicable nature.

The late slight improvement in the state of the iron trade here, upon which I remarked last week, appears to be so far well sustained, but after careful inquiry I am not able to state that *all* branches have received the like impetus. Some are slack, others have been favored with orders of good proportions just in time to save short time, whilst some few—not, I should say, fifty firms in all the kingdom—are yet very busy on old orders. Scotch warrant prices have gone up a couple of shillings or so, on the strength of a rather stronger demand. Warrants (G. M. B.) are currently quoted at about 108/ to 108 6, with disinclination to sell on the part of holders. Makers' prices, as will be seen, are not greatly different from last weeks'. They are: Gartsherrie, No. 1, 118/; No. 3, 110 6; Coltness, No. 1, 123/; No. 3, 108 6; Summerlee, No. 1, 119/; No. 3, 108/; Carnbroe, No. 1, 113/; No. 3, 108/; Monkland, No. 1, 116 6; No. 3, 108/; Clyde, No. 1, 112 6; No. 3, 108/; Govan, No. 1, 111/; No. 3, 108/; Langloan, No. 1, 118/; No. 3, 108/; Calder, No. 1, 120/; No. 3, 108/; Glengarnock, No. 1, 114/; No. 3, 109/; Eglinton, No. 1, 110/; No. 3, 108/; Dalmellington, No. 1, 110/; No. 3, 107/; Carron, No. 1, 117 6; Shotts, No. 1, 116/; No. 3, 109/; Kinnell, No. 1, 115/; No. 3, 108/.

Shipments were last week over 2000 tons more than during the week previous, but 4800 tons less than the corresponding week of 1872. In the Cleveland district little or nothing new can be reported, and there is no material change in the Barrow-in-Furness locality, the leading steel works being busy on rails required for Canada and the States. At Sheffield and in the vicinity Yorkshire made pig is not in very plentiful supply, but prices of such lots as have recently changed hands in the open market have become easier. No. 1 "Ayresome," for the Leeds district, is quoted £5. 10/ to £6; No. 2, £5. 2/6 to £5. 5/; No. 3, £5, and foundry iron £4. 17/6 to £4. 19/. Forge pig is to be had at about £4. 18/ to £5, or a trifle lower for prompt cash. Finished iron is quite firm at recent rates, bars realizing £14 to £15, according to quality; plates, particularly best boiler-plates, are in considerable request. The charcoal qualities made by one or two leading Sheffield houses maintain their previous reputation, and are being turned out in fair quantities. The same is reported to be the case with the Low Moor and Bowling Iron Works, near Bradford. The girder-makers, such as the Butterly Iron Company, North Derbyshire, are doing well on girders for building purposes, as well as on railway and other bridge work. At the various large foundries in and adjacent to Sheffield I hear of no serious diminution of activity, some of them having good substantial running contracts yet on hand.

It would appear very probable that in the face of the almost general enforcement of the constant water supply system in all large towns, the demand for water pipes, cocks, hydrants and other castings, &c., will for some years hence be large and increasing. For colliery castings the new orders are hardly as plentiful or as heavy as last year's, but in most instances a steady business is being done.

The railway wagon manufacturers hereabouts are fully employed on 6, 7, 8, &c., ton wagons for companies and railways. This is generally considered to be an expanding branch of industry in every particular.

The brassworks are fully employed on orders for engine brasses, water cocks, and plumbers' fittings, patent water closets, valves and general brasswork. At one or two leading establishments business was hardly ever in a more active state.

There is still a steadily good demand for files of all descriptions—from the comparatively insignificant warden or humble "rat tail" to the largest kinds produced in the shops. Machines for cutting are gradually being introduced into this trade, resulting in a very material advantage to the manufacturer without in any way depriving the hand workers of their accustomed employment.

The inquiry for light edge tools is still fairly good, and the same may be said of saws and sheepshears. A few firms are making tools from specially prepared steel of different kinds, some of which are, I understand, acquiring a substantial reputation, particularly in quarters, at home and abroad, where American made tools (such as axes) were beginning to be preferred. Irons for converting into steel are rather scarce, and not as a rule to be had at less than full prices. Swedish brands rule at from £28 to £32 per ton. German spiegeleisen is reported a trifle cheaper, but I am unable to report that the fall has been of benefit to local firms, most of whom have to pay £14. 10/ to £15. 10/, f.o.b. Rotterdam. A good deal of iron ore is being brought into South Yorkshire from North Lincolnshire, and oolites from Northamptonshire to Sheffield, where also Spanish ore continues to be imported direct. I hear that John Brown & Company intend to erect four or five new blast furnaces close to their newly acquired collieries.

In the steel trade generally it is not possible to record any considerable amount of activity. Nevertheless, a fair stroke is doing in axe, best cast tool, sheet, and other steel, a moderate proportion being for export for the United States, France, India, and some colonies.

As to cutlery there are contradictory reports, but, on the whole, we may fairly conclude that a good many small orders are coming to hand from New York, but neither manufacturers nor factors are in receipt of really substantial indents. It is understood that many of your importers, as well as the agents of Sheffield houses, have heavy stocks of certain kinds of goods warehoused in New York. These will necessarily need to be cleared off before any great demand sets in direct for new goods. Reports from South Staffordshire, Shropshire, Worcestershire, and, lastly, from Birmingham, unite in the statement that no alteration of note has taken place. Bars, sheets, hoops, and all descriptions of finished are in moderate demand, on the basis of £13 to £14 for best bars. There is likewise nothing of importance to record from Wales, save that prices have a slightly upward tendency. The general metal market is more active. Chili Bar is quoted at £81. 10/ for cash, and £82 to £83, with two months, prompt. Wallaroo is £91, cash, and Burra £91 to £91. 10/, with one to two months prompt. English Yellow Metal, 4x4, 8¾d. is being paid. At the Cornish ticketings last week, 2496 tons of copper ore realized £11,872. 14/, being £4. 15/6 (average) per ton; fine Copper ore, 192 tons, 15 cwt.; average produce 73/4; average standard £97. 1/—an advance of £5. 4/ on the last sale. Tin is in demand at £128 for Straits, and £132 to £132. 10/ for Banca. Spelter is rather firmer, prices on the Continent being £26 to £27 for ordinary, and £28 for W. H. Rhenish is £25. 10/ to £26, both in London and at the out ports. English is in moderate supply at £26 to £26. 10/, delivered, and Lead £22. 10/ to £23. 10/. Six hundred tons of Spanish silver-lead are reported sold in the Tyne at £23 per ton.

I cut this from Messrs. Vivian, Younger & Bond's Metals Prices Current of August 23:

"There has been decidedly more demand for some of our articles during the past week, and a healthier and more confident feeling prevails. *Copper.*—At the Swansea Ticketing on the 19th inst., 917 tons ores, average produce 22¾ per cent., sold at an average of 15/5 per unit, the Cape ores, which formed the bulk of the sale, realizing 15/11 per unit for a produce of 23¾ per cent. There will be no sale on the 9th proximo. By private treaty 1100 tons Chilian regulus sold at 16/, and 40 tons Coro Coro Barilla at 18/10½ per unit. In Chili Bars about 1750 tons have changed hands at £80. 15/, sharp cash, to £81. 10/, usual terms for good ordinary, £81. 15/ to £82. 5/, for picked brands, £82. 10/ to £83. 5/, Walker, and £81 to £81. 5/ for Lota. Sales for two and three months', prompt, £82 to £63 g. o. b., and £81. 15/ Lota. There has been a fair business for export, with some increase of speculation. In Australian Wallaroo sold at £91 and £90. 10/, sharp cash, and £92 to £93, with two to three months', prompt; Burra £90 to £90. 10/, cash, and £91. 15/, extra prompt. Makers having a fair supply of work on hand ask £98 for strong sheets, which at present is not freely paid. Further Indian orders have been taken for Copper and Yellow Metal, chiefly the latter, and there seems to be at last some revival from this quarter. In tough and best selected a fair business doing at £88 to £91, respectively. *Tin.*—The business reported during the week has been very moderate in Straits at 128/, and for steamer arrival in three to five weeks at 128/ to 128 6. The market closes rather firmer. Ten tons Banca sold at 133/. English in fair demand at 126/ to 128/ for ingot. *Tin Plates* unchanged; demand moderate, and parcels still offering from second hands under current rates. *Iron.*—No change. *Spelter.*—The market has been hardening for some days, and foreign much inquired for. Silesian specials sold at £26, London and out ports; English, £26 to £26. 10/. *Lead* rather firmer, at £22. 15/ to £23. Messrs. J. Berger, Spence & Co., in their circular of August 23, state that 95 tons of Sheet Zinc last week sold by auction in London at £30. 5/ and £30. 7/6 per ton.

Messrs. Pixley, Abell & Co.'s Bullion Circular has these remarks on the bullion movements of the week: *Gold.*—In the absence of all demand for export, about £302,500 has been sent into the Bank, the only withdrawal being £50,000, sovereigns, for Chili. The Warwick has brought £35,000 from New Zealand, the Galicia £10,000, and the Boyne £40,000 from the Brazils, and the Ceylon £14,000 from Alexandria. *Silver.*—The price remains at 59d. per oz. standard for fine bars, owing to the orders for Paris. The market is not firm at this rate, as it is expected that the present demand will soon be satisfied. The arrivals during the week have been about £84,000, and have been chiefly from New York."

In a paper by Mr. John Richardson, on the use of portable engines for mining purposes, we find the following: Portable engines with multitubular boilers and self-contained machinery have of late years been used for winding and pumping in Cornish mines with advantage. Messrs. Robey have during the past 14 years successfully carried out this application in several different ways. The new engine, of the same power as the old class of winding engines, saves a very large amount of space, and consequent cost of buildings. Beyond this, engines of the new type, being combined with their boilers, require scarcely any foundation, and only one man to drive and stoke. They, moreover, work at a much higher speed than the winding drum, and are connected to it by a gearing of 6 or 8 to 1, instead of the engine having only double the speed of the drum, or being coupled direct to it at the same speed. It also compares well with the old type as regards economy of working, having jacketed cylinders, and using high pressure steam from a multitubular boiler. In many other respects the new type of engine presents great advantages over the old style, especially with regard to economy of fuel, the multitubular boiler using a very inferior description of fuel. In most cases slack or small coal only is used, whilst in some instances the fuel burned is composed of two-thirds of the refuse ashes from the stationary boilers, mixed with one-third coal. Two kinds of this engine are in use for mining purposes. The first is self-propelling as well as portable, and is principally used for sinking trial pits. It has a winding drum on either side of the boiler running loose on the main axle, which also carries the driving or traveling wheels. When the engine is traveling the drums are made fast, and revolve with the wheels, but when set to work the drums are disengaged, and are thrown in or out of gear with the engine by a clutch and lever. The second engine is of the semi-portable kind, and may be employed not only for temporary purposes, but as a permanent engine. It has a double winding drum mounted on a shaft at one side of the boiler, the shaft having one bearing on the engine and the other in a wall-box built into the engine house wall. These engines are employed in raising loads of from 1 to 4 tons from various depths, and at speeds of from 250 to 600 ft. per minute. Another arrangement consists of a semi-portable engine fitted with two sets of drums and clutches, specially arranged for working with a tail rope at the bottom of a shaft. An engine on this principle is at work in the Ravenhead Colliery, St. Helen's, at a depth of 310 yards from the surface, hauling along a level 1100 yards in length, by means of a tail rope. In another modification a pair of engines is employed, carrying either a single drum or a pair, on a shaft between them. This arrangement is designed for countries where the means of transit are bad and where heavy weights cannot readily be got into position.

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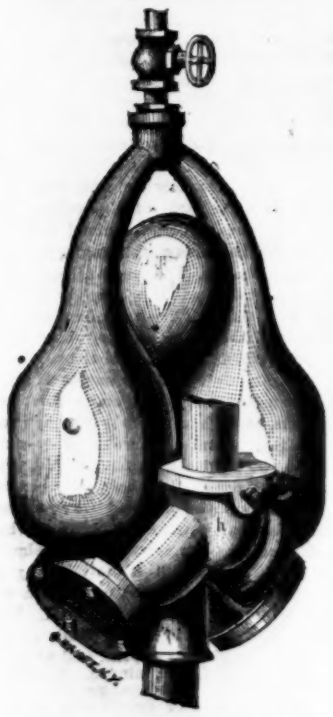

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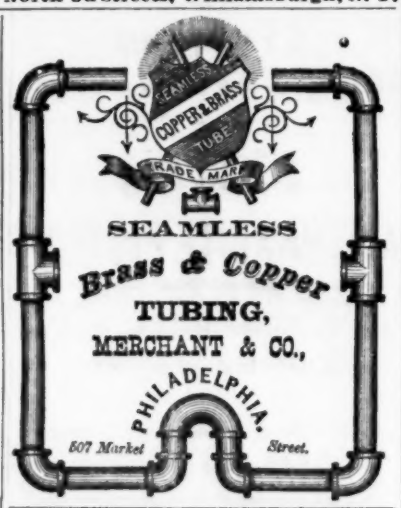

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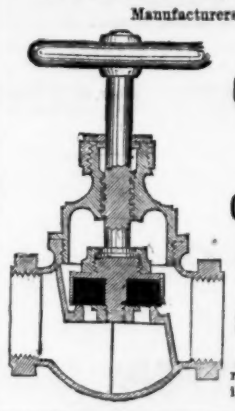

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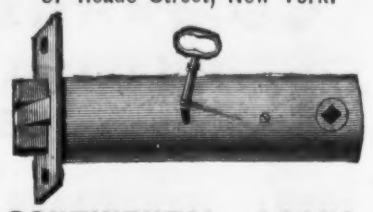

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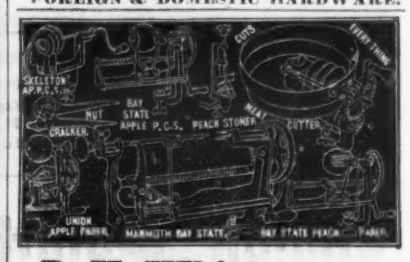

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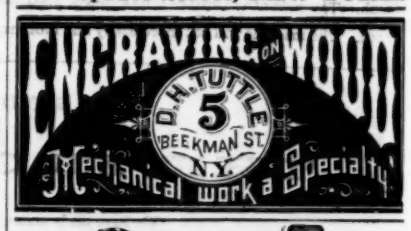

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Casting Iron in Sand Molds.

In Fairbairn's *Iron Manufacturer* we find the following interesting account of the first successful attempt in England to run cast iron in moulds of sand:

In 1706, John Darley, one of the four partners of the brass works known as Baptist Mills, at Bristol, England, conceived the idea that cast iron might be substituted for brass, and prevailed upon some of his workmen to try and make iron castings in molds; but they failed, and considerable loss was incurred in their experiment.

At this time a Welsh shepherd-boy, named John Thomas, succeeded in rescuing a flock of his master's sheep from a snow drift; and later in the spring of the same year, during heavy rain and the melting of the snow, he swam a river to fetch home a herd of mountain cattle. These he collected and drove to the river, but the ford had now become a boiling torrent. He, nevertheless, crossed it on the back of an ox, and brought home the whole herd in safety. As a reward for his courage, his master presented him with four of the sheep which he saved. He sold their wool in order to buy better clothing for himself, and afterward disposed of the sheep, so that he might obtain money wherewith to travel to Bristol and "seek his fortune."

Afraid of being pressed for a soldier if found in Bristol out of place, as it was then the time of the Duke of Marlborough's wars, he requested his master to recommend him as an apprentice to a relative, who was one of the partners of the Baptist Mills. The boy was accordingly sent into the brass-works, until he should procure employment. As he was looking on during the trials of the Dutch workmen to cast iron, he said to Abraham Darby that he thought he saw how they had missed it. He begged to be allowed to try, and he and Abraham Darby remained alone in the workshop the same night for the purpose. Before morning they had cast an iron pot. The boy Thomas entered into an agreement to serve Abraham Darby and keep the secret. He was enticed by the offer of double wages to leave his master; but he continued nobly faithful, and afterward showed his fidelity to his master's widow and children in their evil days. From 1709 to 1828 the family of Thomas were confidential and much valued agents to the descendants of Abraham Darby. For more than 100 years after the night in which Thomas and his master made their successful experiment of producing an iron casting in a mold of fine sand, with its two wooden frames and its air holes, the same process was practiced and kept secret at Colebrook Dale, with plugged key holes and barred doors.

The sleeping partners at Baptist Mills became dissatisfied with Darby, believing that he had lost his judgment, and was wasting money in fruitless experiments. The partnership was consequently dissolved, and Darby drew out his share of the capital. He took a lease of the furnace at Colebrook Dale, and removed with his family to Madeley Court in 1809, John Thomas accompanying him. While Abraham Darby lived affairs prospered; but, unhappily, after death, a brother-in-law, in whom he had confided, acted dishonestly toward the widow and family, and even defrauded some of the workmen.

Young Abraham Darby entered upon the management of the Colebrook Dale Iron Works about 1730. As the supply of charcoal was fast failing, Abraham Darby attempted to smelt with a mixture of raw coal and charcoal, but did not succeed. Between 1730 and 1735 he determined to treat pit coal as his charcoal burners treated wood. He built a fire proof hearth in the open air, piled upon it a circular mound of coal, and covered it with clay and cinders, leaving access to just sufficient air to maintain slow combustion. Having thus made a good stock of coke, he proceeded to experiment upon it as a substitute for charcoal.

He himself watched the filling of his furnace during six days and nights, having no regular sleep, and taking his meals at the furnace top. On the sixth evening, after many disappointments, the experiment succeeded, and the iron ran out well. He then fell asleep in the bridge house, at the top of his old fashioned furnace, so soundly that his men could not wake him, and carried him sleeping to his house a quarter of a mile distant. From that time his success was rapid. To increase the power of his water wheels of 24 feet diameter, he set up a "fire engine" (*i. e.* an old atmospheric steam engine) to raise water from under the lowest and send it to the upper pond, which supplied water to the works, and put in motion the largest bellows that had been made. He obtained additional leases of valuable minerals, and erected seven furnaces, with five fire engines. In 1754 the first furnace at Horsehay was blown in. In December, 1756, Horsehay's work was declared to be at a top pinnacle of prosperity, 20 and 22 tons per week, and sold off as fast as made, at profit enough. Iron rails were laid down for the train wagons between Horsehay and Colebrook Dale about that time.

New Process at Wyandotte.

At the Wyandotte (Mich.) Rolling Mills an interesting experiment is in process which consists, as we understand it, in the employment of the waste gases of a blast furnace in puddling iron. The Marquette *Mining Journal* publishes the following letter describing the results of the process:

WYANDOTTE, MICH., August 24, 1873.

B. F. H. Lynn, Esq.—DEAR SIR: In regard to our experiments here, we have succeeded in puddling the iron in a superior manner, making better time than with coal, and a grade of iron superior to the puddled iron made here from pigs of the same quality.

We ran one full day last week, working out five heats of 500 lbs. pig each in eight hours and five minutes—iron turned out 2579 lbs. We lighted fire at 3:15 a. m., and was ready for charge at five, but puddler was 10 minutes late, so we charged at 5:10, being 10 minutes after our competitor charged. The first heat we came out 10 minutes after our competitor; second heat was out with him; third heat was out 20 minutes before him, and fourth heat 30 minutes before him, and he then retired from the contest and shut down. We made our fifth heat and closed at 1:15 p. m. Consumption of coal tar for the entire day, including lighting and heating furnace, was 3½ bbls. Since then we have made a run on petroleum oil tar, and for this purpose find it superior to the gas tar, although we use a small amount more than of gas tar.

We shall be in full blast all of this week, running full days (if all goes well) in competition with a coal furnace, a full account to be kept with both, that the relative merits may be known. This is done at the request of Capt. E. B. Ward. He gives us considerable encouragement to proceed, and says he is thoroughly satisfied on two points, viz: That we can puddle iron and do it well; also, that we make a good article of iron, and in quite as short a time as with coal—and now wants to know the difference in cost of running.

All parties concerned about the mill are favoring us, notwithstanding the innovations upon the old routine, as it lessens the labor and entirely dispenses with smoke.

Very respectfully yours, truly,
C. J. MEGRIMAN.

Burning of the Etna Furnace.—We take the following account of the burning of the Etna furnace from the Ironton *Register* of the 28th ult.: Last Sunday morning, at about four o'clock, the bridge loft of Etna Furnace was discovered on fire. Alarm was immediately given, but the sleeping inhabitants were with difficulty aroused. The flames spread fast, and it was not long before the entire furnace was on fire. The engine house and casting house were soon beyond any hope of redemption. The efforts of the people who had gathered to the scene were directed toward saving the charcoal, of which there were about $25,000 worth within a very few feet of the furnace. The drop-house was pulled to the ground, and there the men made their heroic fight against the flames. They were successful, and with the destruction of the pot house, casting house and bridge loft, the advance of the fire ceased. It was a brave contest, that to protect the coal, and was of mighty moment to the company.

The cause of the conflagration was the proximity of a wooden beam to the hot blast pipes. This beam had, it was supposed, been fully guarded by some courses of brick. Greater care had been taken in this particular than usual, but fire, it seems, knows no security. The furnace quits for Sunday, and at 12 p. m., last Saturday night, work was stopped, so it is supposed that the wooden beam had been smouldering for some time.

The buildings were comparatively new. They will be put up again, better than before, with iron roof and girders, and possibly, a brick engine house. Mr. Gordon, of the machine shop, went to Etna last Tuesday, inspected the engine and cylinders, and reports they can be repaired and put into operation within thirty days. Mr. Gordon's decision puts to rest the fear that the engine was past surgery. The entire loss in building and material will not amount to more than $5000. The loss of time is the principal ingredient of the damages sustained.

Co-operation in Scotland.—During the past year an iron company, based on the co-operative principle, has been in operation in Glasgow. The origin of the company may be traced to the engineer's short time movement of last year. At the close of that contest a number of the leaders were discharged from their various workshops. In these circumstances it was proposed that a co-operative iron company should be formed, and the first general meeting of those interested in the company was held in July, 1872, at which steps were taken for its formation. The company was registered under the Industrial and Provident Society Act, and the Company Act, and the share capital was fixed at £50,000, in £1 shares, transferable. The company has for its basis the division of surplus profits between capital and labor. After a sufficient amount had been paid into share capital, the directors secured ground at St. Rollox containing 2300 yards, with the buildings thereon. The value of the plant at present in use at St. Rollox is estimated at upward of £5000. Irrespective of a large number of contracts which have been finished, there are at present orders at the St. Rollox department, in engine, boiler, and colliery work, to the amount of £6000. The number of workmen at present employed is 100. This staff will be considerably increased as soon as the buildings and machinery in course of erection for extending the works are completed. These workmen are all shareholders of the company, and the practical management of the works is in hands of Mr. Thomas Howie, engineer. In March last the company purchased six acres of ground at Irvine, for carrying on shipbuilding and marine work in connection with the Glasgow premises, while at Troon a yard was leased for making repairs. At Irvine, a vessel costing £3500 has been built. The keel of another vessel, to cost £6000, has just been laid. There, as at St. Rollox, the workmen, of whom there are 150 employed, are all shareholders. The balance-sheet for the first year is now being made up, and although not yet completed, enough is known to satisfy the directors that it will prove quite satisfactory.

Improved Ship Signal Lights.—William Harvie, a coppersmith of Glasgow, Scotland, is the originator of an excellent improvement in this line, which has come into extensive use for steamships and sailing vessels. He employs lenses on the dioptric system of pressed glass, and has succeeded in getting a paraffin light to burn brightly in any weather, without a glass chimney.

In order to accomplish this result, Mr. Harvie so divided the lamp that the inside chamber formed the chimney proper, the air for maintaining combustion passing down the upright tube, entering under a false bottom. The funnel by which the products of combustion escape from the lamp is so protected that no blow down can take place; indeed, it seems that the Harvie lamp burns better in a storm than otherwise.

When subjected to a photometric examination in the public gas testing office, Glasgow, the Harvie patent signal lamp was found to give, in front, a ray of light from the center of the lens equal in intensity to that given by ninety-eight standard sperm candles, and at the side a ray of light from the center of the lens equal to the light of sixty-seven candles; while the common lamp in front gave a light equal to eight candles, and at the side the light of three candles. And while the naked light of the patent lamp was equal to eight and a half candles, that of the common lamp was only equal to three candles. Hence, not only are the rays of light thrown in the proper direction, but the increased illuminating effect of the light is due both to the lens and the lantern itself.

Lithofracteur.—About a year ago a series of experiments were made near Shrewsbury Eng., in the presence of the British War Office Committee on Explosives, with lithofracteur, the object being mainly to demonstrate its safety in use, storage, and transport under conditions of accident. Subsequently to the trials the committee subjected samples of the lithofracteur to various tests, and their report was unfavorable with regard to two points—viz., the exudation of nitro-glycerine under heat, and the too ready dissolution of the compound in water. The exudation was due to a slight supersaturation of the samples, a matter easily guarded against in the manufacture, while the cause of the substance dissolving too readily was the use of nitrate of soda. The manufacturers of lithofracteur, Messrs. Krebs & Co., having substituted nitrate of baryta for the nitrate of soda previously used, and having taken the necessary precautions against supersaturation, forwarded samples taken at random from their magazines at Cologne to the War Office Committee for examination. The committee having submitted the samples to the necessary tests, reported favorably upon the matter, the report being dated the 8th of April last. The report states that a careful consideration of the results of the trials has led the committee to the opinion that the lithofracteur submitted to them was free from the defects present in the previous samples, and that it might be manufactured, stored, and transported in England subject to the regulations affecting nitro-glycerine compounds. Steps are therefore being taken to obtain a site for the factory which it is proposed to erect, and the necessary plans of the buildings are being prepared, which, with the site, will shortly be submitted to the Home Office for approval.

Special Notices.

To Village Authorities and Others,

Who desire, by the establishment of a

Hardware Manufacturing Co.,

Employing at present about forty hands, to improve their Village and enhance the value of their Real Estate, by donating suitable land and building, and by subscribing to a portion of the stock, are requested to communicate, stating the size of the building offered and the amount of stock they would subscribe for.

The present Capital of the Company is $40,000.

The size of building required about, 50x100 feet, two stories.

The location preferred, New York State, in the vicinity of stream, lake or pond.

Address

Box 3131, P. O., New York.

THE ATTENTION OF MANUFACTURERS AND business men is called to the natural advantages of Bristol, Bucks County, Pennsylvania, for a manufacturing site, situate on the River Delaware, with a river front of over one mile, navigable for vessels drawing 15 feet water, 18 miles from Philadelphia, on the line of the New Jersey Division, Pennsylvania Railroad, between Philadelphia and New York, and at the terminus of the Delaware Division of the Lehigh Canal, by which coal and iron are brought to our town cheaper than at any other point between New York and Philadelphia.

Bristol is noted as being a very healthy place, with cheap homes and low rents, good public and private schools, six churches of different denominations, and several manufacturing establishments already established. It contains a population of over 5000, and is constantly increasing in size and population.

Believing that Bristol possesses advantages that few other towns possess, and that the attention of manufacturers need only be diverted in this direction, the Burgess and Council have enacted the following ordinance, viz.:

Be it ordained and enacted, by the Burgess and Council of the borough of Bristol, and it is hereby ordained and enacted by the authority of the same, That all manufactories which shall be erected within the borough of Bristol, during the period of ten years from and after the passage of this ordinance, shall for and during said period be exempted from the payment of borough tax.

Enacted into an ordinance at the Council Chamber, this fourteenth day of July, A. D. 1873.

CHARLES E. SCOTT, Burgess.

Attest: J. WESLEY WRIGHT, Clerk.

BRISTOL, Pa., July 21, 1873.

A Rare Chance

To step into a well established Retail Hardware Business, up town, west side.

Capital from $10,000 to $15,000 required.

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A Pattern Maker in Metals

For fine castings, wants to get a situation. He is reliable and perfectly competent.

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319 Pearl Street, New York.

Special Notices.

IVES & ALLEN, Montreal, P. Q.

MANUFACTURERS OF

Hardware, Stoves, Hollowware,

Ornamental Iron Work, &c.

Agents for American manufacturers of Hardware and Machinery. **Consignments Solicited.**

Wanted.

A first-class man to take charge of a Puddle Mill and a Merchant Mill. None but a thoroughly competent person need apply. Also a Founder, for an Anthracite Blast Furnace. He must be fully conversant with the duties of his position in all its details.

Address **IRON,**

Box 473, Pottsville, Scuylkill Co., Pa.

Warfords, Robinson & Co.,

LINE OF 37 BARGES

FOR TRANSPORTATION OF

Lumber, Coal, Iron,

and all heavy freight, between

Troy, New York, Providence,

and all intermediate places.

180 Broadway, WEST TROY,

28 Lumber District, ALBANY,

19 Coenties Slip, N. Y. CITY.

Translations and Condensations.

The undersigned, commercial Editor of *El Cronista* the Spanish Government paper in this city, and Foreign Editor and Translator of the *Daily Bulletin*, has made it a specialty for years past to translate industrial matter, with the strictest adherence to the technical wording, from and into English, German, Spanish and French, for manufacturers, patentees and others, and begs to be recommended to the iron masters and trade in that capacity.

C. KIRCHHOFF, Box 2806, Post Office.

Latest Publications translated by C. KIRCHHOFF. "German Imperial Consular Instructions." "Cuba may become Independent." Officially endorsed by the governments of Germany and Spain.

To Furnace Men and Malleable Iron Manufacturers.

For Sale or to Let.—The McHaffie Steel Co.'s Works, at Lamokin, on the P. W. & B. Railroad, at its junction with the Baltimore Central, comprising Foundry, Annealing Furnaces, Machine, Blacksmiths' and Carpenters' Shops, &c., &c. These Works are most eligibly located, and with ample facilities for doing a large business. Parties desiring such property are requested to apply in person at the Works, or by letter addressed to "The McHaffie Steel Co.," Chester, Delaware Co., Pa.

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By R. T. Hazell & Co.,

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Our REGULAR SALES of HARDWARE, CUTLERY, FANCY GOODS, &c., will be held on TUESDAYS and FRIDAYS throughout the season.

CASH ADVANCES made on CONSIGNMENTS without additional charge.

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Capital - - $6,000,000, Gold.

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The New York Agency, No. 50 Wall Street, buys and sells Sterling Exchange, makes Cable Transfers, grants Commercial Credits, and transacts other Banking Business.

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This most successful English Engineering Journal, containing thirty-six pages, weekly, illustrating the latest advances in Civil, Mechanical, Mining and Military Engineering Science, both in Europe and America, can now be obtained by American subscribers, post paid, for $9·30, currency, per year, sent to the New York office of the Journal.

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The best medium for advertising American Machinery to the attention of European capitalists.

Send for specimen copy, free.

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An established Wholesale and Retail **Hardware and Cutlery Business,** in New Haven, Conn. **Centrally Located.** For particulars, address, giving full name.

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Rolling Mill Machinery For Sale

One train, 3 high, finishing rolls, with steam engine 75 H. P.; and balance wheel, 20,000 lbs.—complete and in good order—by

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23 & 25 Commercial Street, Boston.

BOSTON, Nov., 20, 1872.

FOR SALE.

Machinists' Tools, Patterns, &c.

The Hope Iron Works, Providence, R. I., contemplating a change in their business, offer for a large and valuable collection of Machinists' Tools, which have all the latest improvements.

Blacksmiths' & Pattern Makers' Tools.

Also a large and varied assortment of patterns more extensive than usually found. They also offer Patterns and Special Tools for the manufacture among others, of the following specialties, which equal, if not superior, to any made:

Hangers, Pulleys and Couplings.
Geared Pumps.
Portable Engines of all sizes.
Hoisting Engines of all sizes.
Boiler Fronts and Fittings.
Grind Stone Troughs.
Tools and Fixtures for Blacksmiths.
Lathes and Planers.

Many of these specialties would make a business, and are worthy the attention of machine shops and foundries looking for business. Address

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We have a ***Magnetic*** Iron Ore of ***Superior*** quality, that we can deliver at Piermont or Southfields, on Erie Railroad, in quantities to suit.

WM. E. COFFIN & CO.,

Boston, MASS.

For Sale or To Let.

The Stove Foundry lately occupied by Munsell & Thompson, situated at Elizabethport, N. J.; can be adapted to any manufacturing purpose, having coal and iron within one block, direct from the mines. Communication with New York 32 times a day by rail, and 4 times by steamboat. Within half a block of the river. Will be let for one or more terms of years. Apply to or address

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The undersigned design going into the exclusive Iron and Heavy Hardware trade, and offer their well established business in **Shelf and Builders' Hardware** For Sale.

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Valuable Iron Works, For Sale.

The undersigned offers for sale the Iron Works in Pottsville, Schuylkill County, Pa., known as "The Washington Works," consisting of a

Large Stone Machine Shop & Foundry,

Brick Pattern House, Erecting Shop, Stone Blacksmith Shop, Brick Office, and Lot of Ground containing in front 195 feet 3 inches, and in depth 260 feet.

There will be sold with the above a large and valuable collection of Patterns, Heavy Crane Flasks and Heavy Core Spindles for making heavy Castings and Pipes of all sizes; Turning and Planing Tools.

The Works can be put in immediate operation. A favorable opportunity is here presented for enterprising men. The demand for Castings and Machinery is constantly increasing in this region. The property will be sold on liberal terms. ***If not sold in a reasonable time it will be for Rent.***

For particulars apply to

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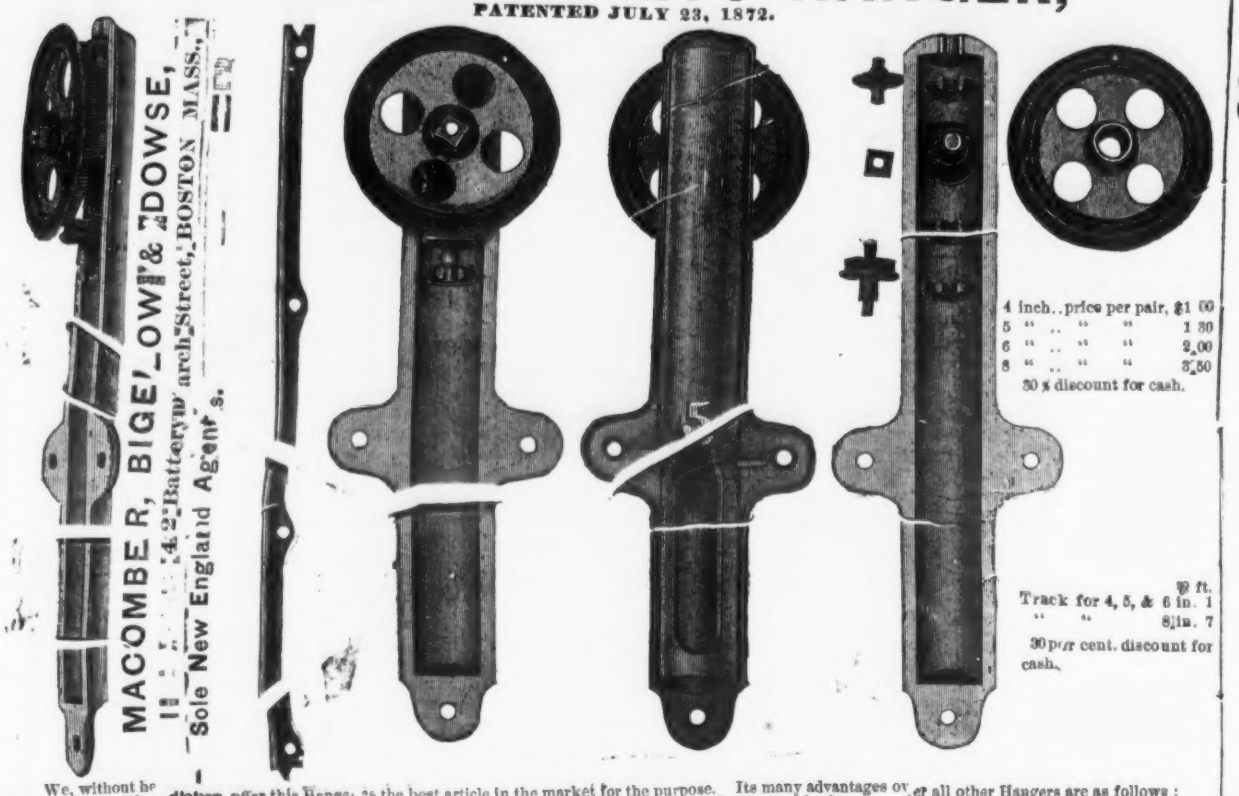
Pottsville, Pa.

PATENT NOVELTY HANGER,

PATENTED JULY 23, 1872.



4 inch..price per pair, $1 00
5 " .. " " 1 30
6 " .. " " 2 00
8 " .. " " 3 50
30 % discount for cash.

Track for 4, 5, & 6 in. 9 ft. 1
" " 8 in. 7
30 per cent. discount for cash.

We, without hesitation, offer this Hanger as the best article in the market for the purpose. Its many advantages over all other Hangers are as follows:

1st.—It is more than **double as strong** as any other Hanger, owing to its semi-cylindrical or curved back.

2nd.—It is provided with a friction wheel at the top of the Case, which bears against the rear or outside of the sheaves, and prevents it from **leaning outward** and causing it to **RUN TRUE**, a feature not attained in any other Hanger.

3d.—By this device the doors are always held up **Close to the Frame**, and maintain a close joint around it.

4th.—The sheave has but one flange, there being a lower friction wheel provided with a flange which extends out under the face of the sheave and bears against the outer side of the track, which takes the place of the extra flange in the sheave, thus doing away with the **grooved sheave** which always grinds or breaks.

5th.—**IT CAN NEVER RUN OFF THE TRACK.**

6th.—It is the **easiest running** Hanger made, our 5 in. answering the same as 6 in. of the checkback and ordinary makes.

7th.—It is the Most Complete Hanger, in its construction, being tasty, as well as durable.

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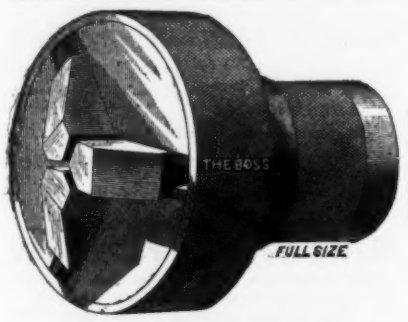
Also Agents for the CONNECTICUT CUTLERY CO., of Naugatuck, Conn., and keep on hand a complete assortment of their goods.



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is warranted to be the best and most perfect made Chuck in use. It holds from 0 to three-eighths inch, and is truly the Boss Chuck. Every piece is made of Forged Steel, and finished to a Gauge. Give it a trial and you will be satisfied; if not, return it at my expense, and your money will be refunded. Address

A. F. Cushman,

Manufacturer of all kinds of Lathe Chucks,

HARTFORD, CONN.

Orders from the trade solicited.

E. C. C. KELLOGG
PATENT.
Feb. 18, 1866.

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Pronounced by those who have used them the handiest and most desirable tool in use of its kind. As will be seen, the combination consists of

BELT PUNCH, KNIFE AND AWL,

ALSO,

Needle for Lacing Rubber Belting,

So combined that each tool does its specific work and does not interfere with either of the others.

E. C. C. KELLOGG, Hartford, Conn.

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Trade Mark, H. NELSON. } 157 East 32d Street, N. Y., { Trade Mark, H. NELSON.

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Mining & Paving Tools,
H. Nelson's Solid Eyed Pick,
Kip Hammers,
Stone Breakers,
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Hand or Mash Hammers,
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Shackel Bars,
Block Stone Sledges,
Mauls,
Sledges,
Blacksmiths' Sledges,
Masons' Brick Hammers,
Swedges, all sizes,
Mill Picks, Crow Bars,
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Masons' Stone Axes,
File Cutters' Hammers,
Striking Hammers,
Fullers, all sizes,
Horse Shoers' Tools,
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HAMMERS of all kinds made to order, on receipt of Pattern or Drawing. Special attention paid to R. R. Work.

STAR TOOL COMPANY,

MANUFACTURERS OF

13, 15 and 16 inch Swing-Screw Cutting Engine Lathes,

12 & 15 inch Swing Drill Lathes,

10¼ in. Swing Jewelers' Bench Lathes, &c.

Also, E. F. Allen's

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STAR TOOL CO.,

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P. O. Box 3760.

UNION HARDWARE CO.,

MANUFACTURERS OF

Skates, Skate Straps, Handles, Base Knobs, Wood Turnings.

Also, Dog Collars, Muzzles, Parlor Skates, &c.

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Factory at Wolcottville, Conn.

Our Illustrated Catalogue is now ready for the fall trade of 1873, representing a full assortment of the largest and best stock of Skates in the market.

Send for Catalogue.

"Easily Applied and not Liable to get out of Order."—From Report of Judges at American Institute Fair, 1872.

The Challenge Door Spring Co.,

Patented] Exclusive Manufacturers of the [March 4, 1873.

In Appearance the Most Beautiful. In Action the Most Graceful. In Use the Most Reliable.

The Challenge Springs are manufactured from **Steel Wire, tempered by an Improved Process,** the result of repeated experiments, and must not be classed by dealers with the numerous worthless "Coil Springs" made from common Bed Spring Wire.

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Tucker's Alarm TILLS,

FOR SALE BY

RUSSELL & ERWIN MFG. CO., New York,
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The Iron and Steel Institute at Liege.

OPENING ADDRESS BY MR. I. LOWTHIAN BELL.

The following is a translation of the address of Mr. I. Lowthian Bell, president of the Institute, at the opening of the session lately held in Liege, Belgium. The address was delivered in French, with the speaker's customary ease and fluency, and our translation will be found an interesting contribution to the current literature of the iron trade:

At the period of the establishment of the Iron and Steel Institute, probably the most sanguine among us limited our expectations to seeing it occupy a position of usefulness among the iron and steel manufacturers of Great Britain. Art and science, however, recognize no political or geographical boundary, and our rules were, very properly and designedly, so framed as to admit to the rights of membership any one interested in our proceedings, to whatever nation or continent he might belong. Among the proofs of the success we have, as an Institute, achieved, certainly not the least in importance has been the applications for admission from gentlemen in all parts of the world, the list embracing not only those who have distinguished themselves as successful manufacturers, but also the names of some of the greatest metallurgical philosophers of the day. I trust I am correctly interpreting the sentiments of our hosts, at whose invitation we are now assembled on a foreign soil, when I read their graceful offer of hospitality as a mark of sympathy with the object we have in view, and as evidence of an intention, on their part, to assist us in its pursuit. It would be quite foreign to the purposes of this meeting were any time devoted to the mere enumeration of the various imports or exports, or of the manufactures themselves, indicative of the high trading position of the Belgian people. That which alone interests us, and to which I alone feel myself justified in alluding, are those branches allied with the production of iron, and even this must necessarily be done in very general terms. As you well know, the foundation of Belgium's capability as an iron making country lies in her coal fields, in which, however, the mineral is found under such conditions, in respect to depth and the nature of the beds, as to have taxed to the uttermost the ingenuity of her mining engineers to furnish this indispensable element of commercial greatness. In spite, however, of any natural obstacles which have to be surmounted in working the collieries of this country, the system adopted is such as to enable the Belgian coal owners not only to meet the demands of home consumption, but also to furnish to other nations no inconsiderable quantities of the produce of their mines. This, during the past year, amounted to between five and six millions of tons, which is about one-third the quantity exported from Great Britain during the same period, the entire produce of the latter being about 123 millions of tons against something like 14 millions, which, I understand, was the out-put of Belgium. Although the coal formation proper of Belgium, like that of Northumberland and Durham, is destitute of workable beds of ironstone, the adjacent schistose rocks and limestone are fairly rich in ores of the hematite class. A portion of these is exported, not, however, from any actual superabundance, because four or five times as large a quantity is brought into the country as that supplied by it to foreign nations. In the year 1872, the weight so imported amounted to nearly 800,000 tons, chiefly obtained from France and Germany. With the above-mentioned advantages of coal and ores of iron, in the hands of an enterprising people, it is only natural that early attention should have been paid to the establishment of iron works in Belgium. Prior, however, to the year 1828, the pig iron made in this country was almost exclusively smelted with charcoal, and, as a matter of commercial importance, when estimated by its extent, so long as the forest and not the mine is the source of the furnace fuel, no nation can long occupy a very prominent position in the iron trade of the world. In all Belgium there were at that time, I believe, not above half a dozen coke furnaces, and I trust I may be pardoned if I remind a meeting held in Liege that to a fellow countryman of our own, John Cockerill, is due the honor of building the first coke blast furnace in this country.

But the rulers who preside over the destinies of this country have wisely seen, that in order to turn to the best account the elements of national prosperity placed at their disposal, those engaged in the mines and manufactures must be suitably educated for the proper discharge of their various duties. For this purpose, throughout the country, we find located schools of the highest order of excellence, for the teaching of practical science. Amongst these it may be permitted to mention: The Ecole des Mines, at Liege; the Ecole des Ponts et Chaussees, at Ghent; the Ecole des Arts et Manufactures et des Mines, at Louvain; the Ecole des Mines, at Mons; the Ecole des Mineurs, at Charleroi. The last one named in this list, it should be especially remarked, is devoted to the education of men in the position of our underviewers and foremen of departments. Beside these, there are numerous others for communicating instruction in advanced industrial science, both theoretical and practical, and next ear will be added to the University of Brussels chairs for teaching the usual branches of learning afforded in mining schools. The existence of such establishments as those to which I have alluded will account for the fact of there being found in the Belgian iron works so many scientifically educated managers and directors, and that the manufacturing operations under their superintendence, so far as my observation enables me to judge, are conducted in a manner dictated by sound principles of economy, as the same are understood at the present day. Attached to these seats of learning there have been, and are, teachers of unquestionable capacity. The name of M. Adolphe Lesoinne, Professor of Metallurgy at the University in this town, is associated with the most indefatigable labor to render his course of lectures of the highest practical utility to the students; and my personal intercourse with M. Krans, of Louvain, has led me to infer that the professors generally entertain a high sense of the importance of their mission, by the care with which they themselves study the constant changes introduced into the processes they have undertaken to explain. I have more than once had occasion to observe that hitherto a systematic study of the principles upon which our processes are founded has received more attention at the hands of scientific investigators on the Continent than in our own country. In illustration of this, I may mention that so early as 1844, M. Valerius, a native of Belgium, published his work on the manufacture of iron, which was followed seven years afterward by a second, of great excellence, on that of pig iron, chiefly in relation to the smelting establishments in this immediate neighborhood; and for the last sixteen years there has appeared at Liege the *Revue Universelle des Mines et de la Metallurgie*, a periodical which enjoys as high a reputation as an older one of the same character—I mean the *Annales des Mines*, of Paris.

Assembled as we now are, away from the home of the Institute, at one of the localities, and within a few hours' journey of others, in the three great ironmaking States of Continental Europe, viz., Belgium, France and Germany, it may be interesting to consider, very briefly, of course, some of the pecular circumstances affecting the production of this metal as compared with those of our own country. The history of the expansion of the iron trade during the last twenty-five or thirty years indicates with remarkable clearness the nature of those social changes which have followed the introduction of improved modes of transit and of extended international communication. A community of a purely pastoral and agricultural character is more or less shut out from the world, when the physical difficulties attending the export of its produce are such as to check its commere with the rest of mankind. The life of its inhabitants is necessarily of the simplest kind, and the money value of the fruits of their labor, and of the labor itself, will be found very small when compared with that of a people occupying a more fortunate position. When manufacturing industry is introduced to a limited extent into such a society as the one I have just named, the artisan is more or less affected by the prevailing condition of the surrounding population—living is cheap, and wages are low. At a time (1870) when animal food was selling in England at 7d. to 8d. per lb., its cost at Fullonica, in Italy, I found to be only 5½d.; but the field laborers received only 1/ to 1/2 per day, blast furnace keepers a little above 4/, and slagmen 2/10. It Irun, in Spain, the miners in the iron mines were content to work for 2/; and at Bilbao, where butcher meat (1872) was sold at 4½d. per lb., furnace keepers had 4/6, best blacksmiths 3/6 per day, and puddlers 5/ per ton, rates which were less than two-thirds of those current in England at the same time. It is unnecessary to multiply instances all pointing to the same result, otherwise figures might be given showing, generally speaking, cheap food and low earnings by the men in the ironworks of Norway, Sweden and Austria. It might, at first sight, seem immaterial what a man's wages were, provided the cost of the necessaries of life corresponded with the rate of his pay. It is, however, a remarkable fact that, as a rule, however low priced provisions may be in these cheap countries, labor is paid for on such a scale as to compel the greater portion of the working population to subsist on very miserable fare. Thus, the ordinary diet of the countryman in the south of Spain, with his 15d. per day, consists of gaspacho, to furnish which he boils in water one kilo of bread and one ounce of olive oil, and this serves for all his meals for one day. Very few of the workmen of the superior class partake habitually of animal food, and, as a consequence, we find inability for any great physical exertion, which necessitates the employment of an increased number of hands, compared with that required under a different condition of things. I met with a notable instance of this at a blast furnace near Malaga, making about 35 tons of iron per week, at which four men were constantly engaged at the hearth, whose united wages amounted to only 6/10 per day, or an average of 1/8½ each. In such cases no thought is bestowed on economising labor, which partly accounts for the presence of those four men, and for the seven who, I ascertained, were required for filling the furnace in question. Thus we have, for the causes just mentioned, about twice as many workmen engaged in turning out about as much iron in one week as some of our English furnaces are able to do in twelve hours. Great Britain presents the very antithesis to a community living under the circumstances I have named. Its mineral wealth led to the organization of manufacturing undertakings in which coal or iron ore entered largely, and there was, and is, maintained within its dominions a population far in excess of the food-producing powers of its soil. To supply this deficiency recourse had to be made to foreign nations whose means and position enabled them to afford the necessary assistance. It is true, for many years an artificial barrier was raised against the unrestricted importation of the necessaries of life, on the ground that the owners of land, farmers, and agricultural laborers would be overwhelmed in common ruin by what was designated as unfair competition. The experience, however, of thirty years of free trade has proved that every section of society in the British Isles, whether territorial, agricultural or industrial, has largely profited by the change in national policy. With all this help from without, human food is unquestionably dearer with us than in any other part of the world, but, on the other hand, wages are such as to enable our laboring class to live in a manner never dreamt of by an inhabitant of many districts where living is within reach upon much easier terms. With regard to the three nations whose iron making capacity I propose briefly comparing with that of Great Britain, we should probably not be wide of the mark in supposing that fifty years ago they resembled pretty closely Spain and Italy at the present day, *i. e.*, agriculture was practically the only pursuit of their inhabitants, and the produce of the husbandman's labor was disposed of at very low prices. The formation of railways and the extension of steam navigation have enabled the farmers of Belgium, France and Germany to forward their crops at a small expense to more distant markets than was within the power of their predecessors. These same railways have also afforded facilities for rendering available the natural resources, mineral and otherwise, of these respective countries, and hence there has rapidly sprung into existence a vast number of industrial establishments, metallurgical as well as others. These two sources of outlet have sensibly affected the value of the fruits of the soil, and, as an example, I may quote one instance of a German province in which, compared with 25 years ago, butcher meat and butter show an increase in the one case of 50 to 80 per cent., and in the other of nearly 85 per cent. Along with this change in the cost of living, wages had also risen at the period of my inquiry (1867), so that, speaking generally, it may now be assumed the price of food and wages in the three countries under consideration occupy an intermediate place between Great Britain and those where the population are almost exclusively engaged in tilling the land. To show upon what foundation this opinion is based, I have extracted from my notes of a journey performed in 1867, the different figures of rates of wages given me at different works I visited. In France, where butcher meat was charged 7d. per pound—

	Averages. s.	d.	
Coal hewers were paid 2/6¼, 2/9½, 3/2½, 3/7¼, 3/9½, 4/, 4/	3	5	per day.
Coal putters, 1/7, 2/, 2/, 2/9½	2	1	"
Laborers in ironworks, 2/2½, 2/2½, 2/5, 2/5, 2/10	2	8	"
Coke burners, 2/5, 3/2½	2	9¾	"
Masons, 3/2½, 3/2½, 3/7½	3	4	"
Joiners	3	2½	"
Blast furnace keepers, 3/2½, 3/3, 4/	3	6	"
Blast furnace assistant, 2/4½, 2/9½	2	7	"
Blast furnace slagmen	2	9¼	"
Puddling iron per ton, 5/10, 5/10, 6/2½, 6/4, 6/9½, 7/2½	6	4¾	per ton.

On the Rhine the price of animal food was given me as 7¼d. per lb.

Coal hewers received, 3/, 4/	3	6	per day.
Laborers in iron works, 1/6, 2/	1	9	"
Coke burners	3	0	"
Blast furnace keepers, 3/, 3/6, 4/	3	6	"
Blast furnace assistant, 2/6, 2/10, 3/	2	9	"
Blast furnace slagmen, 2/, 2/, 2/8	2	1	"
Puddling iron per ton, 4/9½, 5/5, 5/5, 5/7, 5/8	5	5	per ton.
Head rollers	6	0	per day.

In Belgium, butcher meat could be had for 7½d. per lb.

Coal hewers were paid 3/2½, 4/, 4/9½	4	0	per day.
Blast furnace keepers	2	4¾	"
Blast furnace assistant	2	1	"
Blast furnace slagmen	2	1	"
Puddling iron per ton, 4/, 4/9½	4	4¾	per ton,
Head roller, 4/, 4/9½	4	4¾	per day.

In the county of Durham, where animal food, in 1867, cost 7d. to 8d. per lb.

Coal hewers earned from 4/1½ to 5/6	4	9¾	per day.
Putters, 2/ to 3/	2	6	"
Laborers in iron works	2	10	"
Coke burners	4	8	"
Masons	4	6	"
Joiners	3	6	"
Blast furnace keepers	6	3	"
Blast furnace slagmen	4	0	"
Puddling iron	8	0	per ton.

It is only proper to observe that any attempt to institute a rigid comparison between the expense of manufacturing iron in the different countries named, based on the above figures as factors, would only lead to fallacious results. This is due to natural differences in the raw materials of coal and ore, and to the fact that in Great Britain dearer labor has forced upon the manufacturer more complete arrangements for its economy. Messieurs Gruner and Lan, in their very comprehensive and able work on the state of the iron manufacture of England, written in 1862, mention, in regard to wages, that labor, which in France costs one franc, commanded one shilling with us. Without knowing their opinion, I arrived at the same conclusion as regards France, and the same difference appears to obtain in Belgium and Germany when compared with the rates then prevailing in Great Britain. I shall not venture to express any views on the future of the labor market in either the British or Continental iron trade. As you are all aware, within the last year or eighteen months, under the influence of an unusual demand for every species of industrial product, wages have experienced, generally, the most extraordinary and unlooked-for changes. In the iron works with us it may be taken that the rates of to-day are 50 per cent. above those of 1871. So far, however, as I have been able to ascertain, the increase which has taken place on the Continent is not above one-half of that which has been conceded by the English and Scotch ironmaster. The class which is directly benefited by an augmentation in the value of the product of the soil is, of course, the agriculturist, and it might be thought that so far as the exportation of provisions tends to raise the cost of living in the exporting country, the manufacturing interest derives the reverse of any advantage from the change. Against this, however, we have the admitted fact that concurrently all branches of industry in Western Europe have progressed with strides unknown in the world's previous history. As regards iron, this is strikingly true, and in spite of any increased cost of production due to higher wages, improvements in machinery, and in some of the processes themselves, have, until very recently, enabled the ironmaster to deliver the metal to the consumer on as favorable terms as formerly. Leaving the present abnormal condition of industrial affairs on one side, and confining ourselves to the relative state of the manufacture of iron in Great Britain and on the Continent, as it existed two years ago, and for some time previously, the obvious question arises as to what the supremacy of the former is due, in the matter of quantity produced. In the actual cost of a given amount of labor we stand in an admittingly less favorable position than our colleagues in Belgium, France, or Germany. Do we possess greater natural advantages in the possession of raw materials than they? is the question to which I propose shortly directing your attention. In respect to ore, many difficulties intrude themselves in the inquiry, due to great differences which exist in the facilities attending the extraction of the mineral and its conveyance to the furnaces in different localities of the same State. As an example, in our own country the cost of ore on a ton of iron varies from 12/ to 40/. So it was in France, speaking of it before the war with Germany, where ironstone, yielding 35 per cent. of metal, was delivered at the furnaces at less than 3/ per ton, while at other works a ton of iron cost 44/ for the ore they were smelting. The relative advantage enjoyed by either nation must, therefore, be determined by the proportion of the cheaper and dearer varieties consumed. After a very minute investigation on this point, Messrs. Gruner and Lan, in the work already mentioned, settled the average difference in favor of France, at 8/ (10f.) on the ton of pig iron; and according to these very competent authorities, Belgium is stated as being then equally favorably situated in respect to the cost of its ore. The German works on the Rhine have to deal with somewhat more expensive sources of iron than either of the other two countries, but this inferiority of position is partly neutralized by cheaper fuel, as will shortly appear. And now a few words on the question of coal, which, during the last twelve months, has proved an object of such absorbing interest to the whole civilized world. Of this material of the iron makers' art, Great Britain furnishes, in round numbers, twice as much as Belgium, France and Germany put together. This she is able to do by virtue of the number and extent of her coal fields, but it is a fallacy to suppose the iron trade of the British empire has expanded to its present proportions in consequence of coal being worked much more cheaply than is the case in the three other States with which we are comparing it. To place this clearly before the meeting, I will give the cost given me of raising a ton of coal in different places during visits paid in the year 1867:

	Average. s.	d.
Belgium—5/7¼, 7/1½	6	4¾
France—3/0½, 4/2, 4/9½, 5/, 5/3½, 5/4¼, 6/0¾, 6/7¼, 6/7¾, 6/9½	5	4½
Germany—Rhenish Prussia—4/8, 4/8, 4/9½, 5/, 5/7	4	11½

In Great Britain, at the same time, we should probably not be far from correct in accepting 4/ as the average cost of delivering the fuel at the pit's mouth in the chief iron making centers of our own country. To all these figures has to be added the cost of conveying the coal to the iron works, and this, in the case of Belgium and Germany generally, will be done as economically as with ourselves, inasmuch as the furnaces and mills, like our own, are placed on the coal fields. In France, on the other hand, the fuel has occasionally to be conveyed considerable distances, but in some cases the iron works are established near the coal mines. The expense of transport, in this last named country, sometimes amounts to as much as 8/ (10 francs) per ton; but this high charge is usually met, to some extent, by an advantage in the price of the ore. The truth, however, is, that if we wish to arrive at a sound appreciation of the subject under discussion, we must dismiss from our minds all question of cost, and confine our attention to the market value of coal, a value which, of course, is determined by the relation borne by the demand to the means of meeting it. In France the supply is so far below the requirements of a large nation that a considerable deficiency has to be made up by importations from abroad, incurring thereby a heavy charge for carriage. Coal under these circumstances was, according to Messrs. Gruner and Lan, fully double the price it commanded in England in 1862. The difference between the cost and market value at the pit I found, in 1867, was from 4/6 to 5/ per ton. Belgium and Rhenish Prussia, on the other hand, are both coal exporting countries, and were able to raise the mineral at the period we are considering in such quantity that the margin between the cost of production and sales was from 2/ to 2/6 per ton in the former, and from 2/3 to 2/9 in the latter. Ore costing, according to the French authors referred to above, 8/ less on the ton of pig iron than the average of that smelted in Great Britain, gave this country, with its cheaper coal in 1867, an advantage not exceeding, on our entire make, a few shillings per ton over Belgium; and in Rhenish Prussia the lower price of fuel would go far toward enabling the German smelter at that time to work as economically as the manufacturer near Liege and Charleroi. Thus it will be seen from what has preceded that Great Britain owes the pre-eminence she has hitherto enjoyed as an iron making nation not so much to her ability to work coal greatly below the cost of that obtained from the mines of Belgium, France, or Germany, but because she possessed what hitherto may have been regarded as unlimited powers of production in respect to her fuel. A complete revolution in prices has occurred since the date of these comparative estimates. Notwithstanding the enormous coal producing powers of Great Britain, the demand upon its resources has overtaken—indeed, gone beyond—its present means of supply; and to the infinite amazement of every one, the selling price of furnace coke rose in the chief seat of its manufacture, viz., the county of Durham, to about double that charged two years ago to the least favorably situated iron works in France. It may be further observed, as a fact worthy of notice, that, according to the price currents of the day, coke is as dear in the North of England as it is at Charleroi. Included in the requirements made on the British coal fields are some 15,000,000 of tons taken by foreign countries, a quantity which it is needless to say is far in excess of the deficiency which has been the cause of fuel rising with us to fully three times its former figure. Leaving on one side the imprudence, indeed, the impossibility, of such a change in our commercial policy as that of forbidding the export of coal, it is open to us to imagine the probable result of such a course of action. The 15,000,000 tons would be thrown on our hands and the Continental ironmasters would have to compete with those of our country; the latter drawing their supplies of fuel from an overstocked market, and the former from one with coal at famine prices. It may be alleged, and with reason, that the recent exorbitant prices are opposed to the public good, but we must look to the natural course of events and not to legislative interference for working the cure. What I would respectfully submit is that most instructive lessons in the all important science of political economy are involved in the experience of the last year or two.

The Great Ferrara Pumping Engines.

Within the past month Messrs. J. & R. Gwynne, of the Hammersmith Iron Works, have completed what are said to be the largest pumping engines ever constructed, to the order of the Ferrarese Land Reclamation Co.

The district they are intended to drain is the extensive marshy and lacustrine tract between the outlets of the river Po and what was once one of its ancient courses, the present Volano—a region recently made familiar to one's knowledge by the extensive and calamitous inundations from the outburst of the waters of the Po between Polesella and Crespino, whereby some thousands of acres of land previously reclaimed by the inhabitants were temporarily put once again under a considerable depth of water. The great district about to be drained is bordered on one side by the Adriatic, and lies nearly midway between Ravenna and Venice. It is some 20 kilometres in length by 12 in breadth, and its surface varies from the condition of wet marsh to a submerged morass under a metre in depth of water. Its superficial area is over 75,000 acres; and the work of draining it is being carried out by an Anglo Italian company, promoted in England by Messrs. Cutbill and De Lunga, of Cannon street; the practical operations being conducted under Mr. James Longridge as English and the Commendatore Bella as Italian engineer; and the amount expected to be expended being half a million of money, one moiety of the capital being subscribed in the Italian district itself. The tract has already some large drains and canals existing—that of the Po di Goro protecting it from the sea—but others are to be cut in each direction at every kilometre apart, from which the run of the waters will be converged upon the southern or Ravenna border of the tract at Codogoro, where the great pumping station will be erected, the drainage waters being there ejected into the Volano, and thus discharged in the Adriatic. The whole of the pumps will be there placed in one great building, and they are considered to be equal to the discharge of ten days' continuous rainfall. The Po flows, as is well known, upon an embankment of its own silt, and advantage will be taken of this to supply, by means of syphons, water for irrigation in dry seasons, if it be necessary.

The selection of the class of pumps for the work was a matter of some anxiety, and special visits were paid by the engineers to Holland and other countries, where drainage operations of magnitude were well understood, and although wheel-pumps are much used in the Netherlands, the best Dutch authorities concurred in the superior advantages of the centrifugal pumps, if they could be made on a compact scale of dimensions. Messrs. Gwynne undertook the engagement, and the workmanship and design of their machinery alike do justice to their enterprise. The pumps, eight in number, are made in pairs, each pair being driven by an engine of 500 horse-power indicated, working under a boiler pressure of 70lb., and an idea of their magnitude will be obtained from the fact of their collective throw of water being over 2000 tons per minute.

The following are the exact details of these important machines. The eight centrifugal pumps are worked by four compound condensing engines; each pair of engines with cylinders 27¾ in. diameter of high pressure, and 46⅝ in. of low pressure; stroke of engines, 2 ft. 3 in.; revolutions, 115 per minute; i. h. p., 500; boiler pressure, 70 lb. The condensers are two in number for each pair of engines, and are bolted to the discharge of each pump, the water from which passes through the condenser tubes (5 inches in diameter); the cooling in each condenser is 750 feet, therefore there are 1500 feet condensing surface for each pair of engines. The air pumps are single acting, 18 in. in diameter and 12 in. stroke. A sluice-valve is placed on the discharge of each pump beyond the condenser, and is opened and closed by hydraulic power. The two pumps attached to each pair of engines are 54 in. in diameter, with disc 5 feet diameter, the disc being removable without interference with the pump or pipe—a very great advantage. The pump spindles are of forged Bessemer steel. Each pump will discharge 57,000 gallons per minute, at a mean lift of 7 ft. 3 in., or 255 tons, consequently each pair will throw 114,000 gallons, or 510 tons per minute. The total number of eight pumps are thus equal to the discharge of 456,000 gallons, or 2040 tons per minute.

The boilers are ten in number, two being spare. Each boiler has two flues, uniting into a combustion chamber, and contains 108 three-inch tubes four feet long at the back. The heating surface of each boiler is 730 square feet, and the grate surface 30 feet square.

The Iron Age.

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The National Federation of Employers.

In our issue of last week, we gave an outline of the organization and purposes of the National Federation of Employers in Great Britain, and expressed the belief that the movement would not result in benefit to the industrial or commercial interests of the country. As this opinion may seem to be at variance with those heretofore expressed in these columns, when pointing out to American employers the necessity for concerted action in resisting the unreasonable and unjust demands of the trade unions, we reserved our reasons for so believing until this issue, that we might have the space in which to present them fully and explicitly, which we shall proceed to do.

As we have shown, the National Federation of Employers is intended as a counter movement to the trade unions. As such the workingmen will understand it, and every movement of the Federation will be regarded as an overt act of hostility, to be met by vigorous aggressive or defensive measures. The workingmen know, as well as the public at large, that an association of employers wielding a great and formidable power, will not exercise that power merely for their own protection. Human nature is much the same in one walk of life as in another, and human nature cannot resist the temptation to seize an advantage and make the most of it, especially when the only influencing considerations are those of self-interest. The leaders of the trade unions will take advantage of the fact that employers have organized a strong federation, to denounce the tyranny of capital and increase the popular excitement to a dangerous pitch. If the unions find themselves defeated and threatened with disruption, there will not be lacking unprincipled demagogues to urge them to acts of violence against the persons and property of employers. The workingmen have a fearful power for mischief if their evil passions are aroused, and for their readiness to resort to violent measures of resistence to capital the English government and the English nation are chiefly to blame. For centuries the British workingman has been a human machine, toiling without hope of advancement for the scanty wages barely sufficient to keep his family from want and misery, and sometimes failing even in this; while the wealth his labor produced has passed into the hands of the favored classes, to be used for his oppression, and to make wider and more impassible the gulf which separates him from the sphere of life from which he is, by the accident of lowly birth, forever excluded. As a consequence, generation after generation of workingmen have grown up in ignorance, discontented but seeing no way of escape from the hard lot marked out for them by their hereditary masters, the owners of the land and the hoarders of the accumulated wealth of the nation. What wonder, then, that they should abuse the new-found power they have secured through organization? What wonder that they should be blind to their true interests, caring only to secure present advantage in the largest wages for the least labor? To them the subtle reasonings of political economists, the legislation of time-serving statesmen, the appeals of employers threatened with ruin, are nothing. They only know that they have suffered wrongs in the past, and only realize that they have a momentary advantage, which must be maintained at any cost. Ignorance, always dangerous, is doubly so when the passions of the ignorant are aroused and their wrath excited. They have bettered their condition at the expense of their employers, not realizing that the evils suffered by capital will react upon labor certainly and surely, and they will not surrender the advantage gained without a struggle. Revolutions never go backward, and though the strong hand of power may wrest from the people something they have gained and which they cherish, it is only through the shedding of blood, which is sooner or later avenged. Why should we wonder, then, if the ignorant workingmen are so blind to every consideration of self interest as to resist the power of the Federation, when that power is felt, with force? The British workingman is a monster not to be trifled with. He has in an eminent degree all the traits of character which the world has learned to admire in the British nation. He has that tenacity of purpose, that Anglo-Saxon courage to resent a real or imagined wrong, that doggness of resolution when once a determination is formed, and that unwillingness to be imposed upon, which characterize the full-blooded Briton at home and abroad. These are all admirable qualities in themselves considered, but they are often dangerous qualities when highly developed in uneducated men of strong passions and dull brains; and they are the very qualities which make the British workingman a formidable enemy when his anger is roused. With this fine animal the Federation of Employers has to deal. If it adopts a wise and conversative policy, calculated to promote the true interests of the working classes, while protecting the interests of capital against unjust and unreasonable aggressions on the part of labor, it may accomplish great and permanent good: if it opposes force to force, and seeks to drive labor back to the poverty and degradation from which it tries to escape—if in a word, the National Federation of Employers shall seek to perpetuate the manufacturing prosperity of England by making wages again so low as to practically pauperize the labor of the country, labor will turn upon capital as a serpent upon the heel that crushes it, and will wound it sore in the struggle which must ensue. Society will triumph in the end, no doubt, and order, if not peace, be restored, but not until after the nation has been shaken to its center, and cherished institutions crumbled in the dust. Great Britain has been hovering on the verge of revolution for many years. One by one, the government has conceded the demands of the people, and but little is needed to shatter, without bloodshed, the foundations of the whole political system of Great Britain. The traditional, unreasoning loyalty of the middle and working classes to the Queen and constitution is a thing of the past, and now the power behind the throne is the will of the people. The day may be yet far distant when the throne will be pushed aside, the laws of primogeniture and entailment, which have been a curse to the nation, repealed, and the burden of a costly and useless system of royalty and nobility lifted from the shoulders of the people; but nothing would tend so powerfully to bring about such a change as a war of classes—the capitalists against the workingmen, the rich and powerful against the poor and desperate. Such a war is threatened by the organization of the National Federation of Employers, and the issue none can foresee.

In our discussion of this interesting question we have had in mind throughout, its bearing upon the relation, present and future, between capital and labor in this country. In times past we have urged united action on the part of American employers in resisting the unreasonable demands of the trade unions, and we still believe such co-operation a necessity: but there is such a thing as carrying a correct theory to an extreme and, consequently, dangerous application, and we believe this is being done in Great Britain. In our opinion, the proper way to deal with the trade union movement is to let it alone. When strikes are declared or demands made upon employers to which they cannot accede in justice to themselves, a policy of firm and unconditional resistance should be maintained, and employers should sustain and support each other for their mutual protection. But the whole system of class organization is radically wrong, and can only postpone indefinitely the establishment of permanently harmonious and satisfactory relations between labor and capital. The workingmen will learn in time, as they are already learning in this country, that their interests are best promoted by means which insure absolute freedom of contract between master and man. They will learn that strikes are costly, and hurtful in their immediate and ultimate effects; that skilled labor will command its market value everywhere without the intervention of trade associations—it has in England, and does still, although its value has been and still is kept down by the relative disproportion between workmen seeking employment and employers seeking labor; that trade unions, whatever the nominal objects of their organization, are practically agencies employed to secure for indolent and unskilled workmen the advantages enjoyed by the industrious and skillful, to the permanent disadvantage of the latter; and that labor has nothing to gain from assuming an attitude of hostility to capital. These will be the simple and unmistakable teachings of experience, and employers will learn in the same school, if they do not know it already, that no combination on the part of labor can long suspend or defeat the operation of those natural laws; which, though but imperfectly understood by the community, determine surely and correctly the value of labor, as of any other commodity of exchange. If, however, capital shall organize for aggressive warfare against labor, and shall seek by the power of its resources and the manifold agencies at its command to compel cheap production by forcing cheap wages, it, too, will suffer defeat, and grave and serious consequences will follow. Nothing would so much tend to the propagation of socialistic theories and false doctrines fatal to the well being and good order of society, and nothing which has this effect could result in good.

Lake Superior Iron Exports.

We find the following in a recent issue of the Marquette *Mining Journal:*

"Going away from home to get the news," is well examplified by a statement lately made by *The Iron Age* concerning the shipment of pig iron from the United States to England, as follows:

The increased demand has had the effect of advancing the price not only of pigs but of all the finer qualities of charcoal iron for general purposes; and, as the supply of Swedish iron is limited, a demand has sprung up for American charcoal pig, which promises a steady and permanent increase. Since the opening of the current season of lake navigation four cargoes of charcoal pig iron have left Marquette, Michigan, for British ports, and from ten to twelve thousand tons have been sent to Montreal from the same point, presumably for export, as the Canadian market requires no such increased supplies.

To "British" ports it is true several cargoes have gone, but these ports being Toronto and Montreal, consigned to iron companies at those places, we have no right to suppose they went to "British" ports on the other side of the water.

Not but a considerable portion of American pig iron has gone to England—by way of Baltimore and Montreal—or that we do not expect more to be shipped, and the shipments in due time to become large, but as yet Marquette has no knowledge of any of her iron being so exported.

The statements made in the article referred to and quoted from by the *Journal*, were made by us upon information sent us by a gentleman well acquainted with the Lake Superior district and its iron trade. Our authority was good, and we fully believed that the statements we made were true in every particular. Their contradiction by the *Mining Journal* caused us to take some pains to verify them, and it must be confessed that the results of our inquiries are contradictory. Our informant reiterates his previous statement, and sends us the names of several gentlemen, leading citizens of Marquette, who assert of their own knowledge that four cargoes of pig iron, of 500 tons each, have been sent to England direct, and that from 10,000 to 12,000 tons had been sent to Montreal and Toronto within, we suppose, a comparatively recent period. We are also authorized to state that Hon. Wm. D. Kelley, who has lately returned from the Lake Superior country, was told while there by responsible citizens, of one shipment of 2000 tons of pig iron direct to Glasgow, to be used in the manufacture of car wheels; also, of one shipment of 3000 tons to Montreal, for reshipment to England. This information is so direct and so specific that we should, under any circumstances, consider it sufficient authority for a statement not in itself improbable. On the other hand, we publish in another column a table compiled from the records of the Bureau of Statistics, and received by us through the courtesy of Mr. Jas. M. Swank, Secretary of the Iron and Steel Association, showing that no iron of any kind, except in the form of manufactured articles, was shipped to England direct from this country during the fiscal year ended June 30th, 1873. This does not, of course, cover any shipments made during July and August, nor does it show whether any have been made to Canadian ports of iron for reshipment to British ports. It will be seen that our exports of pig iron to British America amounted to 50,946 pigs, valued at $126,924, some of which, at least, may have been intended for reshipment to England.

In calling attention to this matter, we have no wish to provoke discussion with the *Mining Journal.* We are seeking only correct information on a subject of no slight interest to the iron trade of the country; and in the spirit of friendliness we would invite our contemporary to carefully examine the shipping and commission records of Marquette and neighboring ports, that the truth may be made to appear.

Unfounded Hopes.

The Liverpool *Albion*, in a discussion of the situation and prospects of the British iron trade says: "It is quite true that high prices in "this country have stimulated production of "late in America; but it should be borne in "mind that the advance of the last two years "was brought about and maintained even in "*face* of this large production, and it might "be asked 'where would prices have gone to "had there not been a large home supply to "meet part of the American demand?' Although the production in America has been "making rapid strides, it is yet far from being "sufficient to meet their own requirements, "which are increasing year by year on a very "large scale. It should not be forgotten that "this development is going on under the fostering and paternal care of a protective tariff, "which must sooner or later either be greatly "amended or entirely abolished, and then "English iron will easily win its way with "'a fair field and no favor.'"

It is quite natural that our English friends should think what great things they would do in the American market if it were not for our tariff, but we would remind the *Albion* that it has itself given the reason why England cannot hope for much business in iron on this side of the water, with or without the tariff. We will ask it a simple question, and one easily answered: Where would the price of English iron go to if there was any considerable demand upon that market from this side of the water? Had it not been for our protective tariff, which is not likely to be either "greatly amended or entirely abolished," we should have been paying England fancy prices for a very large part of the iron consumed in the country and, by maintaining these prices, have aggravated the very cause which is already depriving England of a considerable share of her export trade in iron to other countries. Nothing would more powerfully tend to make iron dear in England than an active American demand, and nothing would so quickly check that demand and stimulate home production as high prices. So we fail to discover that our English friends have any very good reason to count much upon future trade with this country—at least not until they can make iron cheaper than is now possible or immediately probable. We would further remind our British friends that ordinary English iron has gained a bad name in the American market, from which it cannot quickly recover. What little British rolled iron remains in the market is, at best, heavy stock to carry, and for all present requirements of commerce the American product is sufficient in quantity and satisfactory in quality. The opinion prevails on this side of the ocean that our future trade with England in iron will, taking the average of the next few years, consist chiefly of limited exports to that country. If our neighbors think differently, we are not disposed to quarrel with their opinions; but we would kindly advise them not to put too much dependence upon what they are going to do after our tariff is "greatly amended or entirely abolished."

Analyses of Anthracite Coal and Coke for Blast Furnaces.

We are enabled to present herewith some information concerning mineral fuel for blast furnace use which will be found of interest and value, and which may be accepted as entirely trustworthy. Iron masters using anthracite coal or coke in their furnaces have, as the rule, looked too little to the quality of their fuel. In many instances one coal is considered, practically, as good as another, and the cheapest and most accessible fuel has been, all things considered, the best. We do not need to tell metallurgists that this is often a serious and costly mistake, and that only careful scientific investigation can be relied upon to determine with certainty whether a coal or coke is fit for use in iron making, or whether fuel brought from a greater distance and, if need be, at greater cost, would not be in the end cheaper and more profitable. It is, of course, impossible in the brief limits of a newspaper article to discuss the quality, for iron making purposes, of the various fuels employed in different sections of the country. This must be separately determined in each instance, but as a guide to the intelligent examination of fuels we present the following analyses of anthracite coal and coke, the results of which may be taken as average standards by which the value of other fuels may be determined. The analyses, now given to the public for the first time, were made by Mr. J. Blodget Britton, the eminent metallurgical chemist of Philadelphia. The experience of this gentleman in the examination of coals for iron making purposes is large, and the fact that he is the authority for the accuracy of the following analyses entitles them to careful and intelligent consideration by iron makers:

AVERAGE RESULTS OF ANALYSES OF NINE FAIR AVERAGE SAMPLES OF GOOD ANTHRACITE FROM WYOMING VALLEY.

Moisture	1·38
Volatile combustible matter	3·52
Ash	3·24
Fixed carbon	91·86
	100·00
Sulphur ·220 / Phosphorus ·011	Included in the above.

AVERAGE RESULTS OF ANALYSES OF SIX FAIR AVERAGE SAMPLES OF GOOD ANTHRACITE FROM THE SCHUYLKILL REGION.

Moisture	1·35
Volatile combustible matter	3·78
Ash	5·81
Fixed carbon	89·06
	100·00
Sulphur ·300 / Phosphorus ·024	Included in the above.

AVERAGE RESULTS OF ANALYSES OF NINE FAIR AVERAGE SAMPLES OF GOOD ANTHRACITE FROM THE LEHIGH VALLEY.

Moisture	1·30
Volatile combustible matter	3·05
Ash	3·54
Fixed carbon	92·11
	100·00
Sulphur ·240 / Phosphorus ·005	Included in the above.

RESULTS OF ANALYSIS OF A SAMPLE OF CONNELLSVILLE COKE—AN AVERAGE OF FORTY-NINE DIFFERENT PIECES.

Moisture	·490
Ash	11·332
Sulphur	·693
Phosphoric acid (phosphorus, ·013)	·029
Carbon	87·456
	100·000

RESULTS OF ANALYSIS OF THE ASH OF THE COKE.

Silica	47·90
Alumina	47·76
Sesquioxide of iron	1·43
Lime	1·48
Magnesia	·53
Sulphur	trace.
Phosphoric acid (phosphorus, ·09)	·21
Potash and soda	·49
Undetected matter and loss	·20
	100·00

Not a few of the anthracites sent to market contain a high per cent. of sulphur and a great deal of ash and slaty matter, entirely unfitting them for blast furnace use. The best of them are only second to charcoal for metallurgical purposes. The Connellsville coal is inferior to no other in coking quality. The coke is hard, has a good metallic ring when struck, bears much handling without breaking, does not materially deteriorate by keeping, but loses some of its sulphur. It is an excellent blast furnace fuel, and may be recognized as a standard. A purer coke, however, is afforded by some other of our bituminous coals.

The supposition that sulphur in mineral fuel always occurs in the form of iron pyrites is erroneous. An excess of sulphur is frequently found where very little iron exists. A material difference is also found in the proportion of sulphur discharged by coking; some coals parting with nearly all, while others with but a limited quantity. This is owing to the manner in which the substance occurs, whether free or in combination with other substances. It is noteworthy that no appreciable quantity of sulphur in combination was found in the ash of Connellsville coke.

The International Patent Congress at Vienna.

It is impossible to tell as yet what will be the result of the International Patent Congress assembled at Vienna, but the probabilities are that it will lead to the ultimate adoption by other countries of systems of patent laws modeled after our own. Neither France, Belgium nor England have patent laws which secure to inventors the same measure of protection which is afforded them in this country. In either of these countries it is the easiest thing in the world to take out a patent and about the most costly to defend it against infringement. It is universally admitted by those acquainted with the subject, that we have the best patent system yet devised, and since the necessity of extending better protection to inventive talent has been generally felt in the countries represented in the Congress, the probabilities are that our system, in its essential features, will be adopted as the basis of the international system. If this expectation is realized, we shall have reason to regret that we have not remedied the many and grave defects of our patent system, for, good as it may be, it is susceptible of many improvements and simplifications which would render it more beneficial to inventors as well as to the community at large.

From the establishment of an interna-

tional patent system we, in this country, have little to lose and much to gain. We may safely claim a higher order of inventive talent than any other people, a greater skill in the construction and improvement of labor-saving machinery, and more of general ingenuity. A few years ago labor was cheaper than machinery in many countries, but that time is rapidly passing, and now we see springing up an almost universal demand for labor-saving appliances, even where bone and muscle are held at the lowest value. To supply that demand will require a vast annual production of patented implements and machinery, and if we have not a monopoly of inventive talent, no country has yet ventured to claim ability to compete with us in this respect. We shall, therefore, derive great and permanent benefit from an international patent system, insuring our inventors against the easy infringement of their inventions in countries competing with us for industrial supremacy, and from the extension of the same protection to inventors of other countries we shall lose but little.

We publish on another page a translation of Mr. I. Lowthian Bell's address, delivered in French, at the opening of the session of the Iron and Steel Institute at Liege, Belgium. As usual, Mr. Bell has much to say of interest to the iron trade, and says it well. His addresses, like his writings, are full of valuable facts, clearly and concisely presented, and the one we publish to-day merits the careful perusal which our readers are sure to give it.

CORRESPONDENCE.

PHILADELPHIA, Sept. 8, 1873.

There is an immense deal of nonsense being written and published about the condition of the American iron trade, the progress it has made, and the decadence of the English industry. With all this goes a great deal of unwise and unnecessary buncombe about the superiority of manufacture and our competing in English markets for the control of the trade of the world, etc. All this vain boasting serves no good purpose, even were the premises sound, which they are not; and does real injury in many ways. The American iron manufacturer who has been in the business twenty years, knows full well that he never obtained during the whole of that period any advantage over his English competitor which he did not subsequently have to pay for roundly through the efforts of his enemies at home. The present case is precisely similar to those which have preceded it, so far as the enemies at home are concerned. The press throughout the country is singing pæans over the fact that a couple of thousand tons of charcoal pig iron have gone to England, which country has been importing pure charcoal pig iron from every source throughout the world, where it could be had, for the past two years.

Meanwhile, the Grangers out West are resolving to a man in favor of a revenue tariff, and they are no mean enemy. The free traders are quietly taking in all the figures of our ability of export, our triumphs in hardware, etc., etc., and next winter we shall have the whole fight over again, with the addition of a powerful and wealthy body of English manufacturers combined against us. One of President Lincoln's favorite quaint proverbs was that it was "a bad time to swap horses when crossing a river;" and we are by no means over the river yet. All the efforts of the friends of protection, all the arguments of fact as to what it has done for us, will not serve to stem the free trade tide or answer the statement next winter, that "you are convicted out of your own mouths." "You demanded protection until your industry could stand alone, and now your own journals boast of your ability not only to do so but to send your product over the wo[illegible] If the condition of the trade here b[illegible] erous, why do your columns e[illegible] all a volume of business; that many mills have been idle for weeks in Pittsburgh; that bars are dull at three and one-fourth cents per pound, or that Lehigh forge sold last week at $30 per ton? The truth is, and well the iron master who has had capital in the business for twenty years knows it, that the trade is just beginning to get out of its swaddling clothes. It has not yet passed through the diseases of infancy, and the injudicious coddling it is getting from interviewers who retail what any individual iron master may say, will assuredly give it a serious attack of revenue tariff, from which it may not soon recover. He who believes that a body of men like the iron manufacturers of Great Britain, who have built up a World's trade after years of harder work than we ever had here, of self-denial and no profits, of strikes and lockouts; who have organized and sustained a body like that of the Iron and Steel Institute, will yield to a set back like the present high prices of fuel in England, reckons marvelously without his host. If we have made progress in hardware and tools, it is on account of high wages giving us intelligent labor and labor saving machinery. If we have exported some charcoal iron, it is because charcoal iron is scarcely made in England, and Russia has become the largest customer of Sweden. Does any one suppose that if two-thirds of the furnaces and mills of Great Britain were to stop for three months, fuel could not be had at their own prices on promise of resumption? It is the worst military policy to underrate the strength of the enemy, and it is the worst business policy to brag over a new customer to the man over the way; especially in this case, where the man over the way can afford to give away his goods for a year or two. It requires very little arithmetic to show how small a reduction of duties would change the present state of affairs, and the erroneous statements afloat through the columns of our papers generally will do it sooner than we care for, if not corrected. Hence the necessity of frequent and vigorous exposure of these errors upon the part of those who have the true interests of our iron industry at heart, until the protective system shall have performed its perfect work, when we shall be the first to say, away with it.

NEW INVENTIONS.

Several very promising inventions are before the public here, which merit notice. Among these is the atmospheric passenger elevator. This is an entirely new form of pneumatic hoist, which is the invention of Mr. George W. Hubbard, formerly of the firm of Cresson, Hubbard & Smith, machinists, of this city. The elevator is manufactured at the works of Henry G. Morris, Fifth and Washington avenue, here, and works more smoothly and with greater safety, it is claimed, than any of those now before the public. The air pressure is supplied by a fan, requiring less steam or hydraulic power to run it than with the present method, while the arrangements for stopping and starting are superior. It would be impossible to thoroughly describe this elevator without an illustration, but it is said to fully bear out the claims made for it, of simplicity, durability, cheapness, rapidity and smoothness of motion, perfect control of car, ventilation and absolute safety from falling. The fact that a works of the character of Morris', formerly Merrick & Sons, has undertaken the manufacture of the machine should argue in favor of it.

SOLID STEEL INGOTS.

Every steel maker, whether his product be of crucible, Bessemer, or Martin steel, knows the loss and difficulty to contend with arising from piping, blow holes, scars and cracks in his ingots. A Philadelphian, who has devoted several years to the study of this subject with constant experiments, has apparently at last overcome these difficulties, and succeeded in producing ingots of any grade of crucible steel, perfectly sound and solid. The samples shown are certainly perfect, and the evidence of the works where they were made is that they are uniform, and that the process never fails. Similarly good reports come as to quality of the steel, from those who have used it, and it possesses the peculiarity of welding without a flux, even when of the highest grade of carbon. The method is simply in the manipulation, which produces steel of any grade or mixture preferred by the manufacturer, and results from the metal being made entirely free from contact with the air throughout the process. The claims are for a perfectly solid ingot, free from piping, seams or cracks, homogeneous and uniform throughout; a superior quality of steel; an economy of at least 20 per cent., by reason of perfect solidity, and an economy of manufacture, owing to the saving of wages of skilled labor in pouring, &c. Such a step of progress deserves notice, and although thousands of new steel processes have not borne out their promise, this seems likely to do so, inasmuch as it causes no change in the material or properties used, but simply treats the metal in process of manufacture in a new way. Indeed, it would seem to offer especial advantages to the manufacturer, since he can retain his particular mixture a secret even from his labor.

THE PHILADELPHIA TOOL COMPANY.

A visit to the works of this company, situated at Thirteenth and Buttonwood streets, in this city, lately, showed a progressive and encouraging state of affairs. The specialty here is the manufacture of wrenches, particularly that of the Davis duplex wrench—a tool meeting with favor from the trade. The shops are conveniently arranged, and supplied with excellent tools, milling machines, broaching tools, &c., and the product is thoroughly inspected before shipment. Several new styles of wrenches are preparing for the market, among which was noticeable a handy light wrench, the grip of which is capable of alteration to any size by the turn of a ratchet while used with one hand only. The works of this company are under the direction of Mr. J. H. Armbruster, known to the trade formerly as a manufacturer of chains in this city, and succeeded in that business by Messrs. Bradlee & Co. The goods of this company are honestly made, and have added a new industry to our Philadelphia production which promises to grow into considerable importance.

THE IRON AND STEEL INSTITUTE.

While the American Association of Mining Engineers is deserving of great credit for the invitation to the British Iron and Steel Institute to hold its midsummer session in this city in 1874, it is to be regretted that we have not taken more notice of the reception of that body at Liege, in Belgium. The *Engineer*, of London, prints the address of welcome, delivered by the President of the Committee of Reception, in French, and we have not had it translated in any of our papers. This address was particularly happy, and, after reviewing the progress of the trade, especially noticed the presence of Mr. Danks and the advantages obtained by his process. As a concession to an American inventor, for Mr. Danks, although of English birth, is thoroughly an American in his sympathies and feelings, it is pleasant to find our Belgian friends so willing to yield tribute to merit. One point in the address is worthy of notice by those of our journals which would boast of our beating England in the iron trade, and this is the following: The Belgian president particularly noted the far seeing enterprise of the English manufacturers, who, at their own expense, were to build and equip 10 miles of railroad in China and present the same as a free gift to the Emperor of that land, as an earnest of future trade and a means of introducing a railway system throughout the Empire. When we get up as shrewd and liberal a trade dodge to supply a failing market we can afford to boast of cuteness, and, until then, had best hold our peace, open our ore mines, make outlets for them to market, cheapen our iron products, and leave some margin of profit to each branch of the trade, which, at present prices, seems impossible. Trade is improving steadily, but much more could be done without crowding—and in view of a possibly early winter, those who want stocks of cheap iron had better be securing it. The approach of the close of navigation will find furnace companies materially advanced in their views, and buyers, as usual, will all speak at once.

Hollow Railway Axles.

BY JAMES A. WHITNEY, M. E.

Every casualty, especially with a steam boiler or on a railroad, is certain to call forth from an interested public manifold suggestions of improvements. Of these, a large percentage are always futile on the face of them, a certain other, but much smaller proportion, of manifest utility, and a still remaining number useful only if taken in a sense modified materially from that intended by the originator. In this latter classification must be included the idea, some time since brought out on the occurrence of a railway accident resulting from a broken axle, that it would be a good plan to bore an inch hole from the end of each car axle to test the quality of the metal and prove, if such existed, the presence of internal flaws. But it is plain that this boring would, alone, be more costly than the rolling of axles to shape, a process now capable of successful substitution for the old time method of forging, to say nothing of the waste of metal; for the profitable utilization of wrought iron chips is a thing as yet unaccomplished, their use extending for the most part to the filling of holes about fence posts, and similar plebian functions.

Yet it is doubtful whether a given weight of wrought iron can be put in better shape to secure a maximum of strength under direct strain, resistance to the granulation resultant from long continued jarring, and consequent greater durability, than when made tubular, for the central or axial portion of an axle, like the corresponding part of an untrussed beam, has but slight practical use. This fact has not escaped the attention of dynamic engineers, and American, English and French technical publications show no lack of schemes for the construction of hollow axles. So far as available data shows, however, none of these are in use, and probably in no other line of improvement would an inventor find greater difficulty in securing the trial, to say nothing of the extended adoption, of a new contrivance, than would be the case with an apparatus, however plausible, of the kind referred to. The reason is obvious. So radical a change in even one of the simplest adjuncts of a truck would necessitate the introduction of new, costly and untried machinery, the training to novel operations of operatives trained in, and enamored of, old methods; for a time, at least, an undesirable diversity in the construction of this portion of the rolling stock, and, on the whole, a degree of "botheration" which master mechanics (by the way, among the best and most steadfast class of practical engineers in the country) are commonly most anxious to avoid. Nevertheless, it is against precisely such objections as these that the most notable and necessary improvements have to make their way, and tubular axles, with their acknowledged theoretical, and their probable practical, utility, must receive, at all events, thorough investigation and careful trial before the claims of their advocates can be ignored. But before either of these steps to successful and general use can, or should, be taken the as yet imperfect plans for manufacturing hollow axles must be revised, systematized and elaborated, and, so far as possible, a judicious choice made from among the numerous and widely different projects that, at one time and another, have been brought before the public.

Although the idea of hollow axles dates from the patent (English) issued to Robert Stephenson in 1831, it is only within a few years past that anything at all adapted to meet the actual conditions of railway practice has been brought forward, and, naturally enough, those sprang from the manifest ease with which Bessemer metal could be manipulated to give a tubular shape to the axle without the cost, but with the strength, of wrought iron, and, at a somewhat earlier date, from the analogy of gun barrels and artillery, made from skelps wound spirally around a mandrel and welded upon each other. Assuming the absence of air during the welding operation, a condition practically unattainable, no doubt axles could be made on this plan with an economy closely approximating that obtained by the use of homogeneous metal, and exceeding it in the essentials previously herein indicated. But as the matter stands, the problem evidently lies between the further perfecting of Bessemer steel tubular axles, or the production of such axles from malleable ingots by operations and processes to which our patent records and workshop practice are both alike strangers.

We are not sure as to the date of the first mention of this use of Bessemer steel, but the earliest at hand is that of Bagnall and Deakin, whose invention consisted in the mere substitution of this material for ordinary iron or steel in the fabrication of tubular axles by the methods of James Thompson, brought forward two or three years previous. In this latter the articles were "produced entirely seamless or without weld or join," and were made by forming the bloom into an annular ingot and, by apparatus similar to that employed in the manufacture of boiler tubes, drawing it into tubes of the requisite diameter and length: these tubes being subsequently finished to shape by rolling and hammering. It is not difficult to imagine this process practically carried into effect, not only for this, but for numerous similar purposes. A more simple method, that of Duclos de Boussois, 1860, calculated to include the manufacture of "hollow axles, shafts, gun barrels, and masts, related to the use of cast steel for such purposes. In this a steel ring or annular ingot was rolled upon a mandrel until brought to the requisite form; the ingot having, of course, been previously brought to a welding heat. Similar appliances were used about ten years before in making hollow axles from lap-welded tubes, it being claimed by the manufacturers at that time that "hollow axles can thus be produced of greater uniformity and density of structure throughout than can be obtained by ordinary modes of manufacture," a statement that could hardly be made good at the present time. It is doubtful if any system of hammering or rolling (with force applied radial to the axis) upon a mandrel will meet with much success, as the complexity of machinery and cost of workmanship would be likely to more than balance the evident advantage of compressing the metal upon itself as in the manufacture of solid axles and the like. Hence the need of turning to annular ingots of easily managed metal for material, and drawing apparatus as machinery, in the production of the desideratum under discussion. Aside, moreover, from the claims to adoption of hollow axles to which reference has here been made, there are others that have been urged by inventors, with more or less apparent reason, and to which, possibly, reference may be made in another article.

Statement of Domestic Exports of Iron and Steel during the Fiscal Year Ended June 30, 1873.

Iron and Steel, Manufactures of.	England, Scotland & Ireland.		Canada and Br'sh North Am. Posses.		All other Countries and Ports.		Total value.
	Quant.	Value.	Quantity	Value.	Quantity	Value.	
Pig.....cwts.	....	....	50,946	$126,924	5,381	$13,759	$140,683
Bar..... "	....	....	101	698	6,061	33,069	33,767
Boiler Plate..... "	....	....	742	4,589	....	....	4,589
Railroad Bars and Rails..... "	....	....	6,520	23,450	18,871	80,604	104,054
Sheet, Band and Hoop..... "	....	....	70	1,312	1,117	4,756	6,068
All other Manufactures of Iron and Steel, except Sewing Machines...	....	$452,797	...	1,414,944	....	8,957,735	10,825,526
Total of domestic exports.....	....	$452,797	....	1,571,967	....	9,089,923	11,114,687

BUREAU OF STATISTICS, August 22, 1873. (Signed) EDWARD YOUNG, Chief of Bureau.

Scientific and Technical Notes.

An interesting experiment in

REMOVING PHOSPHORUS FROM IRON IN PUDDLING,

by treatment with a small percentage of fluor spar in the puddling furnace, is announced as having been eminently successful at the iron works at Thale, in the Hartz. The difference of opinion among metallurgists concerning the efficiency of "medicines" of any kind is well known; but any well authenticated results which have been obtained with their employment warrant careful attention. In the case here referred to the pig iron used in the conversion was of the brand known as Ilseder, which ranks with the worst of the German irons, in virtue of its notable percentage of sulphur and phosphorus. The *Journal of the Franklin Institute* says that the iron in question was puddled with about 1½ per cent. of fluor spar, and the product is claimed to have been a fibrous iron, which, when rolled, did not exhibit the slightest trace of cold-shortness. *Apropos* of the same subject, a small application of sodium has been suggested by MM. Girard and Toulaire, who propose to conduct the vapors of sodium or potassium into molten pig iron, and then decomposing the alloy thus obtained by means of a blast of air. It has been declared by Springmuhl that, by addition of sodium to molten iron in a crucible, and lixiviation of the product in water, a very pure and soft iron may be obtained, which, on second melting, loses its porosity.

A correspondent in England sends us the following account of

AN OLD CLOCK,

now running and keeping good time in the Kensington Museum. It was built in the year 1325, by one of the resident monks of Glastonbury Abbey, and has claims upon the notice of the public, not only from its high antiquity, but from its having been the work of one man, from its indicating the time of day and the age of the moon, and the manner in which it strikes the hours and chimes the quarters. It is built entirely of wrought iron, the frame being fastened together by mortise and tenon. It was constructed with the old balance wheel motion, similar in principle to the one used in watches at the present time, the pendulum being at that time unknown. This was afterward applied instead of the original balance. This clock was built by Peter Lightfoot, for the use of Glastonbury Abbey, where it was used until the time of Queen Elizabeth, when it was removed to Well's Cathedral, where it remained keeping good time until about forty years ago, and was then laid aside in the crypt of the Cathedral to make room for a new one. It has recently been placed among other antiquities in the Kensington Museum, and there keeps as perfect time as it did five centuries ago at the old Abbey. Here there are other wrought iron clocks which are interesting, but which we have not space to mention. Another, which is built entirely of wood, with the exception of the escapement, strikes the hour and indicates the day of the month. This was built by John Harrison, of Barrow, Lincolnshire, England, in 1715, for which he received the reward of £20,000 offered by the Board of Longitude, A. D., 1767, for being the "inventor of a nautical timepiece, or chronometer." This is still running regularly at Kensington Museum, and keeps excellent time.

Mr. John Little, of Torquay, has communicated the following account of a new

MECHANICAL SCRAPER, FOR INCRUSTED WATER PIPES,

to the Institution of Mechanical Engineers: The supply of water for Torquay is obtained from Tottiford, near Dartmoor, being carried through 8 miles of 10 in., and 6¼ miles of 9 in. cast iron mains. After the pipes had been in use a few months it was found that the rate of supply diminished, and the cause was discovered to be a rapid accumulation of incrustation arising from an unusual extent of oxidation, the water being very pure and soft. The means devised to remove this incrustation without disturbing the mains was a scraper consisting of four pairs of flat steel arms curved backward, and formed into scraping knives at the back ends, a cup piston being placed in the rear. The scraper was propelled through the whole length of pipes by the pressure of a small head of water behind the piston. Experience, however, suggested improvements in the scraper, and, after several modifications, an improved form was finally adopted. In this six knives are used; each knife is fixed to a short arm, which is centerd on a transverse pin, and is pulled forward by a longitudinal spiral spring. The whole is carried on a longitudinal bar, centered at the front end, and pressed outward by a flat spring, which presses the knife against the side of the pipe, but is prevented by a stop from passing beyond the size of the pipe. A double piston was also used, which consisted of two separate discs, placed a short distance apart on a central rod, and connected to the scraper by a universal joint. This improved form of scraper has proved perfectly successful, and the scraping of the whole length of pipe is regularly performed with it once every year. The application of the scraper has been extended to the 7 in. and 8 in. mains of the town of Torquay, the apparatus for these small sizes being of a simplified form. Were it not for the mechanical scraper, the pipes would occassionally have to be renewed at a cost, for the whole length, of some £30,000.

The Centennial Exposition.

We take the following from the Philadelphia *Ledger* of Aug. 26th:

Whatever of good credit this journal may possess for trustworthiness in its editorial statements it is our earnest desire to have attach to what follows concerning the Centennial International Exhibition. What remains to be done in furtherance of that vast undertaking demands that some such statement shall be made. The Exhibition is to express the progress of the United States in all that benefits mankind, at the end of their first 100 years of independence—the United States, now embracing 37 States and 10 Territories, inhabited by 40,000,000 of people. How vast that progress has been and how multitudinous the material illustrations of it are—no one needs to be told, further than to say that the preparation and the buildings necessary to give it expression in any way adequate to its grandeur and colossal proportions must of necessity be upon a correspondingly colossal scale. But the Congress which first ordered the commemorative Exhibition, whilst it wisely provided the machinery for ensuring the perfect nationality of its character, furnished no money means whereby the National Commission which it created could carry the Celebration and Exhibition into effect. This omission was the one great insuperable difficulty which confronted the National Commissioners from the first day of their organization; and ultimately the impossibility of getting alone without a large amount of money, led to the creation by Congress of the Centennial Board of Finance, authorizing an appeal to the *people* of the States and Territories for stock subscriptions to the amount of $10,000,000.

The money question was thus disposed of after a fashion—the National Commission first created, composed of picked men, selected by the Governors of the States, were still to have exclusive control of the Exhibition—the people in their private capacities were to furnish the money—and the safe custody and faithful management of that money were to be intrusted to an auxiliary Board of Finance, chosen annually by the subscribers to the stock. This Finance Board is now in charge of that branch of the centennial business; and in the coming month of September, and thenceforward, will make the appeal to the people of the States and Territories authorized by the laws of June 1st, 1872. They have already received (mainly in Philadelphia) subscriptions and guarantees of subscriptions, from *private* persons and corporations, of about $1,502,000—the city of Philadelphia has appropriated $500,000, and the State of Pennsylvania has appropriated $1,000,000—making altogether $3,000,000. On this basis the directors of the Centennial Board of Finance go to the people of the country, in obedience to the act of Congress, to ask for subscriptions to the stock, and they go in the belief that the people, when they fairly consider the grandeur of the event to be commemorated, the nature of the Exhibition, the immense magnitude of what the deeds of their ancestors and their own just pride of country require to be done, will respond in a spirit commensurate with the undertaking, if they are satisfied they are intrusting their money to capable and honest hands.

Now, as to this last point, involving the character of the directors of the Board of Finance, for intelligence, scrupulous integrity, high honor, we desire to be clear and emphatic. Appended to these remarks is a list of those directors. Those of them who reside elsewhere than in Pennsylvania will be recognized by the people of their respective States, and some of them throughout the United States. Will any one in New York, or elsewhere, fairly question the high character of Wm. H. Appleton, of the firm of D. Appleton & Co., publishers? Will any one in Massachusetts, or elsewhere, justly doubt the intelligence or integrity of John Cummins, merchant and banker of Boston? Can any question be raised anywhere concerning the ability or honor of John Gorham, the head of the Gorham Silverware Company, at Providence, Rhode Island? Or of Abraham S. Hewitt, of New Jersey, whose great rolling mill at Trenton confronts every traveler, south or north, who crosses the Delaware bridge at that place? Or of John L. Barbour, of Virginia, President of the Orange & Alexandria Railway? Or of Benjamin F. Allen, merchant and banker, of Iowa? Or of Governors Patton and Washburne, of Alabama and Wisconsin? If any doubts can be raised as to these gentlemen they are unknown here, and, as we believe, are not entertained at their own homes.

Similarly, the directors who reside in Pennsylvania are men who are justly held in the highest esteem by their fellow citizens as men worthy of responsible and honorable trust. Disclaiming for that one of the directors who is connected with this journal any share of that just praise herein bestowed upon his colleagues, and leaving others to speak of him, we feel it to be a duty at this juncture to say for the information of the public elsewhere that if the financial interests of the Centennial Exhibition cannot be safely entrusted to those gentlemen, it will be a vain task to look for men more worthy of trust, or who possess to a higher degree the qualities of integrity and scrupulous honor. Their peers, we fully believe, are to be found in all communities—but their superiors exist nowhere; for just what men ought to be in honesty and honor they are to the full. No one in this part of the United States would harbor any question of the proper application of the money of a corporation of which John Welsh, whose name is the synonym of commercial honor, and public and private probity, is the president, or of which Frederick Fraley, known in every large city of the Union as President of the National Board of Trade, is the treasurer, supported as they are by thirteen picked men, every one of whom is either an extensive manufacturer or merchant, the head of an influential railway company, or bank or manufacturing company, or a man habitually trusted in his business or profession. We repeat, that if the Finance Board as at present constituted cannot be trusted with the finances of the Centennial, it will be vain to search for a satisfactory board in this world.

List of the Directors of the Centennial Board of Finance:

William H. Appleton, publisher, New York; John Cummins, merchant and banker, Massachusetts; John Gorham, manufacturer, Rhode Island; Abraham S. Hewitt, manufacturer, New Jersey; Charles W. Cooper, lawyer, Pennsylvania; John L. Barbour, President Orange and Alexandria Railway Company, Virginia; Robert M. Patton, ex-Governor, Alabama; C. C. Washburne, ex-Governor, Wisconsin; Benjamin F. Allen, merchant and banker, Iowa; John Welsh, merchant and banker, Philadelphia; William Sellers, manufacturer, Philadelphia; John Edgar Thomson, President Pennsylvania Railroad Company, Philadelphia; Daniel M. Fox, ex-Mayor, Philadelphia; Joseph Patterson, President Western National Bank, Philadelphia; Samuel M. Felton, President Pennsylvania Steel Works, Pennsylvania; William V. McKean, Manager Public Ledger, Philadelphia; Edwin H. Fitler, merchant, Philadelphia; Thomas Cochran, President of Tax Board, Philadelphia; N. Parker Shortridge, merchant, Philadelphia; James M. Robb, publisher, Philadelphia; Edward T. Steel, merchant, Philadelphia; Clement M. Biddle, merchant, Philadelphia; John Wanamaker, merchant and manufacturer, Philadelphia; John Price Wetherill, merchant and manufacturer, Philadelphia; Frederick Fraley, Treasurer, President of Schuylkill Navigation Company.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, Sept. 10, 1873.

The principal event of general interest occurring in Wall street during the past week was the disruption of the gold clique and the consequent decline in the premium. Probably no one but the members of the clique regrets their discomfiture, which was caused by their inability to handle the large amount of cash gold in the market. Among the events of minor importance may be mentioned the failure of the New York Warehouse and Security Company, which, though showing a nominal surplus of assets amounting to $600,000, has been unable to meet its paper, owing to the financial embarrassment of certain large contractors engaged in building Western railroads. The probabilities are that the company will be granted an extension, and that it will ride over its difficulties.

The money market has been active, owing in part to the course of the gold market, and from the effects of the gold clique to lock up money. Call loans were generally obtainable on pledge of first-class stocks at 7 per cent. For discounts of mercantile paper the rate remains about the same as last week, with a tendency toward stiffness, especially for 4 and 6 months' paper.

In the gold market the premium has ranged between the extreme limits of 115⅛ and 111⅝. The following table shows the range of the daily quotations:

	Highest.	Lowest.
Thursday	115⅞	115⅜
Friday	115⅝	114⅛
Saturday	114⅛	112⅞
Monday	112⅝	112
Tuesday	112¾	111⅝
Wednesday	111¾	111

The stock market has been dull and heavy during the week, with a downward tendency, but with a slight reaction from the lowest prices. The transactions have not been large, but the principal activity has been in Western Union, Pacific Mail, Lake Shore, Wabash, Ohio & Mississippi and New York Central. The highest and lowest of to-day's prices are given below.

Government bonds have been dull, but there has been no further decline in prices than was warranted by the fall in gold. The market closes as quoted below.

The movements in foreign trade for the week have been as follows:

IMPORTS.

	1871.	1872.	1873.
Tot. for week..	$8,133,736	$8,969,052	$7,797,237
Prev. reported..	262,218,874	300,065,207	276,061,520
Since Jan 1...	$270,352,610	$309,034,259	$283,858,757

Included in the imports of general merchandise for the week are:

	Quant.	Value.
Anvils	2	$232
Brass goods	6	608
Bismuth	2	1,277
Bronzes	34	5,541
Chains and anchors	69	4,778
Copper		2,646
Cutlery	124	42,780
Guns	187	19,040
Hardware	107	9,646
Iron, hoop, tons	29	2,320
Iron, pig, tons	1,557	49,208
Iron, sheet, tons	16	2,083
R. R. bars	11,626	246,001
Iron cotton ties	4,000	7,523
Iron, tubes	104	348
Iron, other, tons	490	32,072
Lead, pigs	1,324	8,294
Metal goods	267	25,584
Nails	2	191
Needles	8	3,907
Platina	1	1,795
Per. caps	12	2,162
Saddlery	4	780
Steel	3,157	43,231
Tin, boxes	17,204	160,303
Tin, slabs, 3,267 lbs.	150,697	41,558
Wire	210	4,637

EXPORTS, EXCLUSIVE OF SPECIE

	1871.	1872.	1873.
For the week	$4,894,046	$4,406,670	$5,556,354
Prev. reported	153,930,760	147,186,885	190,229,227
Since Jan. 1	$158,824,806	$151,593,555	$195,785,581

EXPORTS OF SPECIE.

Total for the week	$690,104
Previously reported	39,224,658
Total since January 1, 1873	$39,914,762

The bank statement showed a loss of $7,377,600 total reserve, composed of $6,049,400 legal tenders and $1,328,200 gold. The total liabilities were reduced only $7,544,000, so that the amount of lawful money which the banks now hold above 25 per cent. of their liabilities is $414,850, or $5,491,600 less than last week. The statement shows that legal tenders were locked up early in the week, as no such amount of currency as this decline in the average of the week would indicate has been shipped. The national banks have $1,404,750 lawful money above a 25 per cent. reserve, while the State banks are 983,000 below such a reserve. The following is a comparison of the bank figures of the past two weeks:

	Aug. 30.	Sept. 6.	Differences.
Loans	$288,882,000	$288,374,300	Dec. $508,800
Specie	23,090,200	21,767,000	Dec. 1,328,200
Circ'lation.	27,281,900	27,355,500	Inc. 73,600
Deposits	212,040,500	212,772,700	Dec. 7,617,600
Leg. Ten.	44,729,300	38,679,900	Dec. 6,049,400

Government bonds closed as follows:

	Bid.	Asked.
U. S. Currency 6s	113	113¾
U. S. 6s, 1881, reg	116	116⅜
U. S. 6s, 1881, c	117	117⅜
U. S. 6s, 5-20 reg. May and Nov.	112½	—
U. S. 6s, 1862, c	113	113¼
U. S. 5-20 1864, c	114⅛	114⅜
U. S. 5-20 1865, c	115½	115⅞
" 1867, reg., Jan and July	114½	116
" 1865, con., " "	115⅛	115⅜
" 1867, con., " "	116⅛	116⅜
" 1868	116⅛	—
U. S. 10-40 reg	111⅝	112⅛
U. S. 10-40 con	111⅝	112⅛
U. S. 5s, 1881, con	111⅛	112

The following were the highest and lowest prices of stocks to-day:

	Highest.	Lowest.
N. Y. Cen. & Hudson Consolidated	104	103¾
Lake Shore	91⅛	90⅝
Rock Island	107½	106⅝
Del. Lack. and West	99⅝	99⅛
Wabash	65⅛	62⅝
Harlem	129½	129
Canton Land Co	92⅝	87
Western Union Telegraph	89¾	88½
Northwestern	60¾	60
Milwaukee and St. Paul	47	46¼
Panama	115½	115¼
Pacific Mail	42⅝	41
Eric	58⅞	58⅛
Ohio & Mississippi	38¾	37⅝
Union Pacific	25⅞	25⅛
C. C. & Ind. Central	29⅛	28⅝
Atlantic & Pacific Preferred	24	24
Maryland Coal	23¼	23
Adams Express	92	92

GENERAL HARDWARE.

Business is good and a cheerful feeling prevails. A good many buyers are here and letter orders are coming in satisfactorily. We print in full on the opposite page the article from the London *Times*, to which we referred in our last. This article is important to the trade, and the source from which it comes is very high authority on such a subject.

Sargent & Co. publish the following changes in prices of their manufactures from their discount sheet of July 1:

Dis. per cent.

No. 335, Wrought Iron Shutter Bolts 40
No. 67, Berlin Bronzed Store Door Handles 30
Coat and Hat Hooks 15
Change list as follows:

Nos.	8	18	108	118
Per gross	$1·85	2·25	2·05	2·50

No. 10, Fast Joint Cast Butts, Narrow 33⅓
No. 10, " " Broad 33⅓
Change list as follows:

2x2	2x2½	2¼x2¼	2½x2	2½x2½	2½x3	2¾x2¾	3x2½
$0·83	1·00	1·05	1·00	1·12	1·40	1·35	1·40

No. 15, Loose Joint Cast Butts 45
Change list as follows:

Narrow..	2	2½	3	4
	$0·92	1·12	1·47	2·12
Broad....	2x2	2x2½	2¼x2¼	2½x2	2½x2½	2½x3	3x2½
	$1·05	1·22	1·12	1·22	1·34	1·60	1·60

Parliament Butts and Mayer's Hinges 33⅓
No. 20, Fast Joint Butts, Narrow 6
Low list as printed in book, viz.:

1½	2	2½	2½	3	3½	4	4½	5	6
$0·36	·40	·50	·60	·83	1·15	1·40	1·90	2·30	3·50

No. 20, Fast Joint Butts, Broad ..... 20&10
Change list to the same as revised list of No. 10 Broad.
Nos. 23 and 26, Drilled and Wired Fast Joint Butts..
No. 50, Drilled Loose Joint Butts 40
Change list to the same as revised list of No. 15, on page 172.
Nos. 53 and 56, Drilled Loose Joint Butts 35
Nos. 32 and 42, Drilled Loose Pin Butts 40
Change list:

2x2	2½x2	3x2½
$1·20	1·25	1·60

The list printed in book on all other sizes is correct, and is as follows:

2x3	2½x2	2½x2½	3x2¼	3x3	3x3½
$1·20	1·25	1·34	1·60	1·75	2·12
3½x3	3½x3½	4x3½	4x4	4½x4½	5x5
$2·12	2·34	2·48	2·98	4·00	5·56

Nos. 43 and 46, Drilled Loose Pin Butts 40
The list of No. 20 Snaps as given on our circular of July 1, is wrong; it has not been changed, but is the same as before, $10·50.
Strap and T Hinges, add 1 cent per pound to list of Heavy Strap and Extra Heavy T Hinges from 6 to 16 inch ..... 20&10
Narrow Wrought Butts 22½
Subject to the extra discount of 10 per cent. for prompt cash.

The following are their prices for Sleigh Bells and Straps for the coming season, all prices being subject to the cash discount of 10 per cent.:

Dis. per cent.

Round Sleigh Bells, Rough 55
" " Polished 60
" " White Metal 55
" with Drilled Eyes, Ex. Polsh'd & Brnishd.. 45
" " " White Metal 40
" " " Silver Plated ..... add 10
Open Sleigh Bells, Extra Polished 40
" " White Metal 35
" " Silver Plated, revised list.....

Nos.	00.	0.	1.	2.	3.	4.	5.	6.
	$1·00	1·15	1·50	2·00	2·50	3·25	3·75	4·25..5

Neck Straps, p. 593 to 595 50
" p. 596 55
" White Metal, p. 596 50
" p. 597 55
" White Metal, p. 597 50
" p. 598 55
" White Metal, p. 598 50
Extra Neck Straps 45
" " White Metal 40
" " with Open Bells 45
" " " " White Metal.. 40
" " " " Ex.. 35
Martingale Straps 60
" " White Metal 55
" " " Extra Quality 40
Body Straps.....

Change Nos.	346	359	361	
	$3·50	7·25	4·80	 60

Body Straps, White Metal 55
" Extra White Metal 40
Patent Leather Fancy Straps, Silver Plated 25
" " White Metal 35
Make *void* the list of Shaft Straps and *adopt the following:*

SLEIGH SHAFT STRAPS.

Bound and stitched, with Black or Russet center and bound with leather.

No. 460. Per set.

Polished Bells, 8 No. 2 Shaft Strap Bells, $1·25
White Met'l Bells, 8 No. 2 " " $1·25
Silv'r Pl't'd Bells, 8 No. 2 " " $1·75 } net
Gold " 8 No. 2 " " $1·75

No. 461.

Pol'd Bells, 8 No. 1 Im'd Shaft Strap Bells, per set, $0·90 ..... net
White Metal Bells, 8 No. 1 Improved Shaft Strap Bells, per set, $0·90 ..... net

No. 462.

Polished Bells, 4 No. 2 and 2 No. 3 Shaft Bells, per set, $1 ..... net
White Metal Bells, 4 No. 2 and 2 No. 3 Shaft Bells, per set, $1 ..... net

Fancy Leather, Bound and Stitched throughout.

No. 463.

Polished Bells, 10 No. 2 Open Bells, per set, $1..20
White Met. Bells, 10 " " " " $1..15
Silv. Plat'd Bells, 10 " " " " $1. net
Gold Pl't'd Bells, 10 " " " " $1. net

No. 464.

Polished Bells, 14 No. 1 Open Bells, per set, $1·25..20
White Met. Bells, 14 " " " " 1·25..15
Silv. Plat'd Bells, 14 " " " " 1·25. net
Gold Pl't'd Bells, 14 " " " " 1·25. net

With Black or Russet Center, not Bound.

No. 470.

Pol'd Bells, 8 No. 2 Shaft Strap Bells, per set, $1·15..net
White Metal Bells, 8 No. 2 Shaft Strap Bells, per set, $1·15 ..... net

No. 471.

Pol'd Bells, 8 No. 1 Imp. Shaft Bells, per set, $0·80..net
White Metal Bells, 8 No. 1 Improved Shaft Strap Bells, per set, $0·80 ..... net

No. 472.

Polished Bells, 4 No. 2 and 2 No. 3 Shaft Strap Bells, per set, $0·90 ..... net
White Metal Bells, 4 No. 2 and 2 No. 3 Shaft Strap Bells, per set, $0·90 ..... net

No. 473.

Polished Bells, 10 No. 2 Open Bells, per set, $0·75..20
White Met'l Bells, 10 " " " " ·75..20

No. 474.

Polished Bells, 14 No. 1 Open Bells, per set, $1..20
White Met'l Bells, 14 " " " " $1..20
Br'dway Straps, on Military Leather, Silv. Pl't'd..net
" " " " Gold Pl't'd..add 10
Military H'ness or Russet L'ther Body Straps, Pol.. 20
" " " " " Ex. " ...10
" " " " " W. Metal..5
" " " " " Sil. Pl..add 25
Com. Fin'd Bells, on Pat. Leath. Straps, Pol'd..... 20
" " " " " White Metal..15

Sargent & Co. have a new price list in press, which is to be ready for distribution about the 1st of next January. They say: "This book "will contain a complete description and prices "of all the various goods of our manufacture, "as well as of the manufacturers for whom we "are agents, and will be the most comprehensive "compilation of American Hardware ever pub-"lished."

Russell & Erwin Mfg. Co. quote Torrey's Door Springs discount 40 and 10 per cent. Genuine Emerson Razor Straps are now quoted discount 40 and 10 per cent.

There are no changes to report in prices of foreign Hardware, although the tendency to greater firmness on the part of holders is strongly marked. Business continues good, and the opinion is freely expressed that long before the close of the season assortments will be badly broken. This is the case at present with Peter Wright's Anvils, which we quote at 12 to 12½ cents per lb., gold, and as the manufacturers are at present firm in their views, and the margin of profit to the importer is exceedingly small, it is not likely that heavy orders for these goods will be placed in time for this season's trade.

Recent advices from Birmingham report that the Chain makers have notified employers that on and after the 15th instant they will demand an advance which will be equivalent to one shilling per cwt. on ⅝ Coil Chain, which is now quoted there at 21. "In this market the price is unchanged, although it is conceded on all hands that stocks are unusually light for this early stage of the fall business. From Sheffield we hear of firm rates, with a decided preference on the part of skilled labor to work short time than to yield a trifle in the matter of wages in favor of manufacturers.

There is no change to note in the price of Iron Wire, which is firm at our quotations, with a marked improvement in the demand.

Trade in Stamped and Japanned Tin Ware is very active, and we hear of some large transactions during the past week. Prices are without quotable change, excepting Dust Pans, which have declined 50 cents per gross, and are now freely offered at $18, which figure could be shaded for a large order.

There is a fair demand for Nails at the same figures which have ruled for several weeks past. We quote 10d. to 60d. at $4·50, net, in small or large lots, with the same determination we have before noticed on the part of manufacturers to decline orders for future delivery at these rates. Our Pittsburgh correspondent informs us that the card rate for Nails in that section has been reduced from $4·75 to $4·37½, and adds, "This, in reality, instead of being a reduction, is an advance of 12½ cents per keg, the actual selling price before the change being $4·25. There is an active demand, and the new card rate will be rigidly adhered to."

The Stanley Rule and Level Company report sales of over 60,000 Bailey's Patent Adjustable Planes, to September 1. The extraordinary demand for these Planes, in the last three years, furnishes another instance of the certainty of an ultimate appreciation by mechanics and by dealers, where a high standard of excellence in such a tool is first attained, and then strictly adhered to. The company have spared no necessary care or expense that with the increased production of these goods no depreciation from the original standard for quality should result. The Planes and Plane Irons go into market ready for immediate use, and under a full warranty from the manufacturers.

The following letter will fully explain itself:

BUREAU FOR THE PROMOTION OF AMERICAN INDUSTRY, 32 Nordbahn Strasse, VIENNA, Austria, Aug. 26, 1873.

Russell & Erwin Mfg Co.—GENTLEMEN: I take pleasure in informing you that the jury of Group VII nave awarded your goods Honorable Mention, which is considered a high distinction from the Vienna Exposition for goods of that class. Very truly, your obedient servant,
A. G. MYERS.

At a meeting of the Window Glass Board of Trade of New York and Boston, held on the 8th instant, the following price list was unanimously adopted, to take effect the 15th inst., and all orders received on and after that date will be accepted and invoiced only at this tariff:

PER BOX OF 50 FEET.

SINGLE.

SIZES.	I.	II.	III.	IV.
6 x 8 to 7 x 9	$8·00	$7·00	$6·75	$6·00
8 x 10 to 10 x 14	8·50	8·00	7·25	6·50
10 x 15 to 12 x 16	9·00	8·50	8·00	6·75
13 x 16 to 16 x 20	9·50	9·00	8·50	7·75
15 x 22 to 15 x 30	11·75	10·50	10·00	8·00
16 x 30 to 22 x 30	14·25	12·25	11·00	9·50
15 x 38 to 22 x 36	15·00	13·50	12·00	
24 x 36 to 24 x 40	15·75	14·25	12·50	
28 x 28 to 28 x 42	16·25	14·75	13·25	
28 x 44 to 28 x 50	17·25	15·75	14·25	
30 x 50 to 30 x 51	20·50	17·00	15·50	
32 x 54 to 34 x 56	21·50	19·25	17·50	
34 x 58 to 34 x 60	23·00	21·50	20·25	
36 x 60 to 40 x 60	26·50	24·25	23·00	

DOUBLE.

SIZES.	I.	II.	III.	IV.
6 x 8 to 7 x 9	$13·00	$12·00	$11·50	$10·00
8 x 10 to 10 x 14	14·00	12·75	12·00	10·75
10 x 15 to 12 x 16	15·00	14·00	13·25	11·25
13 x 16 to 16 x 20	16·00	15·00	14·00	12·50
15 x 22 to 15 x 30	20·00	17·50	16·50	13·25
16 x 30 to 22 x 30	22·00	19·25	17·75	15·00
15 x 38 to 22 x 36	23·75	20·50	19·25	
24 x 36 to 24 x 40	24·75	22·50	20·00	
28 x 28 to 28 x 42	26·00	23·50	21·00	
28 x 44 to 28 x 50	27·50	25·50	22·50	
30 x 50 to 30 x 54	31·00	26·50	24·00	
32 x 54 to 34 x 56	32·50	28·00	26·50	
34 x 58 to 34 x 60	34·50	33·00	31·00	
36 x 60 to 40 x 60	39·50	36·50	35·00	

Sizes above—$12·00 per box extra for every 5 inches.
An additional 10 per cent. will be charged for all Glass more than 30 inches wide. All sizes above 52 inches in length, and not making more than 81 united inches, will be charged in the 81 united inches bracket.

The attention of our readers is invited to the advertisement of Friedmann & Lauterjung, on the twenty-sixth page. This firm is engaged exclusively in the manufacture and importation of pen and pocket cutlery, solid steel scissors, shears, razors, razor-strops and hones. They particularly desire the trade to examine their "full concaved Electric razors," concerning which they say in their circular. "These razors have been used almost exclusively by barbers, and being comparatively unknown to the public in general, in order to introduce them into general use, we call special attention to the advantages and peculiarities of our concaved Electric razors. The same are tempered by a peculiar process of our own, which tends to the durability of a fine sharp edge, and we employ only the most skilled workmen at Sheffield, England, to make these razors. Every razor, after having been concaved to perfection in our own establishment at New York, is most carefully finished, tested, and set ready for use before being packed, and we claim that these razors surpass in finish, superiority of temper and cutting qualities any other brand ever offered to the public. Our concave Electric razors shave closer to the skin than any of those ground in the ordinary manner, and in buying our Electric razors the risk of getting a poor one is entirely avoided, because a soft razor cannot be ground fully concave without its edge turning over, and if a razor is burnt or has a flaw, it will show it or break before it can be finished thin enough; beside, each one of our concaved Electric razors is carefully tested and will last a life-time if properly used, without the necessity of its being ground every little while like ordinary razors, especially if our celebrated adjustable Russia leather strops are used." The rapidly increasing demand for their goods has compelled the firm to enlarge their facilities from year to year, in spite of which they can hardly keep up with it, although they manufacture both in this country and abroad.

IRON.

American Pig.—The market for American Iron has ruled exceedingly dull the past week, and without new or important feature. Prime brands of Lehigh No. 1 Iron are obtainable at $44 @ $45, but a considerable quantity of inferior Iron is offering at $42 @ $43. No. 2 is irregular, and quoted all the way from $35 @ $40 per ton. Gray Forge Iron is offering freely at $30 @ $35 per ton. We note sales during the week of 50 tons No. 1 Allentown at $44; 100 tons No. 1 Poughkeepsie, 100 tons No. 2 do., 100 tons No. 2 Carbon, and 200 tons Mottled, all on terms kept private.

Scotch Pig.—Prices abroad continue firm and tending upward, and advices by cable during the week denote a further advance of 8/ @ 10/ per ton. The stock here continues light, and all in hands of speculators, who are asking higher prices. The late arrival of 550 tons Glengarnock was purchased by a speculative party at $45 per ton, and we understand $46 was refused for 50 tons. We quote, nominally, at $46 @ $47. There is very little, if any, Eglinton here, and the value is wholly nominal. Coltness is also in small supply, and held firmly at $51. Gartsherrie is selling in a jobbing way at about $48. Sales in addition to above include 150 tons Coltness at $51, and 300 tons different brands, to arrive, on private terms.

Following are the prices of Scotch Pig Iron in Glasgow, as reported by Messrs. J. E. SWAN & BROS., under date of Aug. 22:

	No. 1	No. 3	No. 4
Gartsherrie	125/	113/	....
Coltness	125/	112/	....
Summerlee	117/6	111/	110/
Langloan	122/6	111/	....
Govan	113/6	111/	110/
Calder	*122/6	112/	....
Shotts, Bessemer	165/	160/	....
do Ordinary	120/	112/	....
Carnbroe	117/6	113/	110/
Wishaw	112/	110/	110/
Monkland	115/	111/	....
Chapelhall	120/	....	....
Clyde	115/	112/	110/
Quarter—Clyde	115/	112/	110/

Glasgow Warrants 3-5, No. 1; 2-5, No. 3, g. m. b. 111/.
*f. o. b. Glasgow, 1/ per ton, extra.

WEST COAST BRANDS—*f. o. b. Ardrossan.*

Glengarnock, Ardeer	117/6	112/	....
Eglinton, Lugar, Muirkirk, Portland,	Branded Eglinton. 113/	111/	112/
Dalmellington	113/	111/	110/

CURRENT RATES OF FREIGHT ON PIG IRON.

To	From Glasgow.	From Ardrossan.
New York	7/6	7/6
Boston	17/	17/
New Orleans	20/	20/
Baltimore	17/	17/6
Philadelphia	16/	16/
Providence	20/	15/

Bar.—The market for Refined from store continues very quiet, though values appear to be about steady.

Old Rails.—The trade in Old Rails continues excessively dull, and the value more or less nominal at $45 for T, $46 for Double Heads. We only hear of sales of 75 tons T on private terms.

New Rails.—All descriptions of New Rails are dull and without transactions. We quote nominally at $65 @ $68, gold, for English, and $75 @ $77, currency, for American at the mills.

Scrap.—The demand for Scrap Iron is limited to lots wanted to fill urgent orders. Sales include 200 tons No. 1 Wrought at $45; 100 tons do. at $44, four months, and 250 tons at a private price. We quote at $44 @ $45 per ton.

METALS.

Copper.—The increased demand noted as prevailing at the time of our last writing has continued during the current week, and quite a large business has been effected on a basis of about previous prices. Sales include about 2,500,000 lbs. of Lake, for forward delivery, at 27c. @ 27½c. Mostly, however, at 27¼c.; and some 600,000 lbs. prompt delivery at 26½c. @ 26¾c. At the close holders, views appear to be a trifle firmer, and we do not hear of any such lots offering below 26⅝c. @ 26¾c., or future delivery below 27¼c. The advices from London continue favorable, and the last quotation of Chili Bars shows a further gain of £1, now £86. There is little if any change to notice in Manufactured Copper, and we repeat former prices. We quote at 40c. for Bolts and Braziers, 38c. for New Sheathing, 45c. for Nails, 26c. @ 27c. for Old Sheathing, 27c. for Yellow Metal Sheathing, 32c. for Yellow Metal Bolts, and 27c. @ 30c. for Yellow Metal Nails, Sheathing, etc.

Tin.—There is little if any change to notice in the general position of the market for Pig Tin. Holders of Straits are firm at 31½c. @ 31½c., gold, but buyers generally refuse to pay these figures, so that transactions are limited to the most urgent wants. Late advices from abroad quote a further advance there, and this tends to further strengthen holders, though no advance is looked for, as the supply of English is pretty free. Banca Tin remains dull and nominal. Sales since our last include about 350 slabs Straits, in lots, at 31¼c., 10 tons English L. & F. at 28c. @ 28¼c., 10 tons Refined English at 29½c. @ 30c., and 50 tons Banca at 34½c., all gold prices. Tin Plates have been in fair request, and prices appear to be more steady than a week ago. We quote: I. C. Charcoal, $10·62½ @ $11; I. C. Coke, $8·50 @ $9; Charcoal Terne, $9·75 @ $10; and Coke Terne, $7·50 @ $8·50.

Lead.—The market for Pig Lead continues very strong, with the tendency still upward. The higher prices asked have in a measure checked the demand, though a fair quantity has changed hands during the week. Sales of 500 tons foreign at 6¾c. @ 7c., gold, and about 500 tons domestic at 6½c. @ 6⅝c., gold. At the close some holders are asking as high as 7⅛c., gold, for ordinary foreign, and 6¾c., gold, for domestic. Manufactured Lead has ruled strong, in sympathy with the upward movement in Pig, though no actual advance has been established as yet. We quote at 9¼c. for Bar, 10½c. for Sheet and Pipe, and 16½c. for Tin Lined Pipe, less the usual discount to the trade.

Spelter and Zinc.—Cable advices report an advance abroad in Spelter, and holders here are now asking 7¾c. @ 7⅞c., gold, for Silesian; the demand, however, is exceedingly light, and we do not hear of any transactions of importance. Domestic plates are in fair consumptive demand, and also a shade higher. Sheet Zinc remains quiet, but steady, at 10c., less 4 per cent., gold, from agents' hands.

Antimony.—The price of Regulus is firmer. Now held at 13⅝c. @ 13¾c., gold, with sales of 30 to 35 casks at the outside figure.

The following are BIGELOW & JOHNSTON'S prices current and remarks, under date of Aug. 30, 1873:

NEW RAILS.—In *Foreign* Iron there is as yet no movement, and prices remain about as last quoted. In *American* some transactions of magnitude are reported, but as yet they are not fully authenticated. No terms have transpired, but it is understood that a long term of credit was involved in the transaction. The imports of Steel continue on a larger scale, and it is notable that this article constituted the sole import of Rails this month.

Foreign Iron Rails	gold,	$64·00 @ 65·00
American Iron Rails	currency,	74·00 @ 78·00
Import at N. York this month, tons,		
Previously since January 1	"	41,449
Total to date	"	41,449
Same time, 1872	"	128,933
Same time, 1871	"	115,891
Foreign Steel Rails	gold,	$108·00 @ 112·00
American Steel Rails	currency,	120·00 @ 125·00
Import at N. Y. this month, tons,		16,741
Previously since Jan. 1	"	48,343
Total to date	"	65,084

OLD RAILS.—With the exception of some few stray lots on the spot, this article remains in the same dull condition previously noted. Prices in England, though lower, are above the ruling quotations here.

Double Heads	currency,	$48·00
T or Flange	"	46·00
U or Bridge		Nominal
Import at New York this month, tons,		181
Previously since January 1	"	9,101
Total to date	"	9,282
Same time, 1872	"	31,747
Same time, 1871	"	26,550

SCRAP IRON.—Very dull.

No. 1 Wrought	currency,	$40·00 @ 42·00

PIG IRON.—There has been a fair business in Scotch, but prices do not respond to the advanced quotations reported by cable. In American there is little doing, and prices are weak.

American Forge	currency,	$30·00 @ 33·00
No. 1 Foundry	"	43·00 @ 45·00
No. 2 Foundry	"	38·00 @ 40·00
Scotch No. 1 Foundry	"	44·00 @ 50·00
Import of foreign this month, tons,		5,453
Previously since January 1	"	39,148
Total to date	"	44,601
Same time, 1872	"	72,181
Same time, 1871	"	52,266

PHILADELPHIA.

MESSRS. LLOYD, SUPPLEE & WALTON, under date of Sept. 9, 1873, write as follows: Trade continues active, although we doubt if as many large orders have been filled as in the week preceding. The leading houses, however, all show signs of life and activity, and although we hear of no exaggerated bills being sold, we have a safe, healthy trade. Shipments continue to go forward at low rates of freights. We are now able to ship as follows: All Rail freights, 4th class, Pittsburgh, 22c.; Cleveland, 22c.; St. Louis, 38c.; Cincinnati, 26c. per 100 lbs., Rail and Lake. Chicago and Milwaukee, 2d class, 22c.; 4th class, 22c. per 100 lbs. In regard to prices we have little to say; generally they appear unusually steady, and but little cutting below the legitimate prices is visible. Traveling salesmen report a healthy condition of trade through the interior, and prospects of a good fall and winter trade.

MESSRS. BLAKISTON & COX, 333 Walnut street, under date of Sept. 9, report as follows: *American Pig.*—Since the advance in price of foreign Irons American Foundry grades have sympathized and become a shade stronger. Producers are less disposed to make concessions in price in order to effect sales, and are looking for better figures than those quoted for some time past. Inquiry has been made for considerable Iron during the past week, and some large sales have been made in No. 1 Foundry. We note sales of 1200 tons Crane, for Hoboken delivery, at about $45; 1000 tons Crane, No. 2 Foundry, sold on time, at $40; and large sale Gray Forge, same brand, at $35, at Hoboken. Many of the furnace companies are complaining of the low figures at which the Rolling Mill Irons are selling, and some of them speak of blowing out in consequence of the losses they are incurring by producing these grades, of which they make a specialty. Many in the trade are of the opinion that Gray Forge and Mottled Irons are now at the bottom, and a further decline will cause a check upon the making. We quote No. 1 Foundry at $45; No 2. do., at $38 to $40, delivered here; Gray Forge at $30 to $32; White and Mottled at $28 to $30, on cars at furnaces. Scotch Pig Iron has strengthened in price since the advance on the other side, and the little that is in store here is now held firmly at $47 for Eglinton, $51 for Glengarnock, Coltness being out of the market. Old Rails and Scrap Iron are a little firmer, and quotations, although they have not changed, are likely to be advanced. Bar Iron sells steadily at 3 6-10 at the Mill.

PITTSBURGH.

PITTSBURGH, Sept. 6.—The situation as regards Pig Iron is substantially as last noted; the market presents but little that is really new or important. The demand continues meagre, unusually so for this season of the year. It is true that there is rather more Iron changing hands, as the mills have nearly all started up, some of them running double time, but they are buying only to meet immediate requirements, hence trade is quiet, not what it usually is at this particular time. If pig would only give some evidence of an advance, there would no doubt be an active demand, as the mills, as a rule, have no stock; but the indications are that as long as there is no advance the hand-to-mouth policy will be rigidly adhered to, as manufacturers seem determined to run no risks that they can avoid. It seems to be generally conceded on all hands that Pig is about as low as it is likely to go; also that it is down to if not below the cost of making it; but while consumers, as already stated, admit this, they still have an apprehension that there might by some possibility be a further shrinkage, hence they are buying very sparingly, and will in all probability continue to do so until there is some evidence of a rise. As compared with last week there has been no quotable change in rates. Choice Red Short Mill Irons are still quoted at $35, 4 mos., although some sales, classified as such, have been reported recently as low as $34, and even $33·50, but it is probable that they were not up to what they were represented to be; or they may have been reported for the purpose of weakening the market. No. 1 Foundry Irons quotable at $38 to $40; No. 2, $35 to $37; White and Mottled Irons, $31 to $33, according to quality. Cold Blast Charcoal, $60 to $65; Warm, $45 to $48. Blooms continue very quiet, and may be quoted nom-

inally at $95 to $110. The arrivals continue light, and the great bulk of that arriving is being placed on former contracts, so that there is no accumulation of stock here, and, as a rule, producers are making no effort to sell, unless it is those who are obliged to realize in order to raise money. The demand for finished Irons is steadily increasing, and while the orders, as a general thing, are comparatively small, there are a good many of them, hence there is a very fair business in the aggregate. This is evident from the fact that the mills have nearly all started up again, some of them running to their full capacity. There is not so much complaint now about a scarcity of orders as there is in regard to prices, which, it is alleged, are entirely too low, and this seems to be generally conceded, taking the raw material as a basis. As it is not likely that Pig will go any lower, it naturally follows, if the allegation above noted is correct, that the price of finished Irons must be advanced. We continue to quote on a basis of 3¼c. per lb. for Bars, but since orders have commenced to come in, this quotation seems to be below the ideas of makers generally, and some of them, it is said, are refusing to sell under 3 and 4 to 3 and 5 tenths. There is an active demand for Sheets, and Corrugated and Galvanized are also in brisk demand. The Nail card has been reduced from $4 75 to $4 37½ per keg—a nominal reduction of three shillings per keg. However, this, in reality, instead of being a reduction, is an advance; the actual selling price before the change, was $4¼, whereas it is now $4½, an advance of 12½c. per keg. There is an active demand, and as nearly all the mills have been idle for some time past, stocks are very much reduced, and some of our manufacturers have been and are still obliged to buy Nails with which to fill their orders. This being the case, the new card will be rigidly adhered to. There is to be another meeting of the Nail Association in a couple of weeks, but it is scarcely probable that any further change will be made in so short a time. There is a continued fair demand for Steel, especially for the finer grades, and prices are firm but unchanged. Manufactured Copper continues fairly active; orders are arriving more freely, and the mills are running, although not to their full capacity. No change in the card. Scrap Iron continues dull, but dealers are confident, now that the mills have started up, of an early improvement in the demand. The Jacobus & Nimick Manufacturing Co. report an active inquiry for Locks, Knobs, Scales and "Novelty" goods generally, but there has been no change either in the card or discounts. The Window Glass trade continues in a very unsatisfactory condition, so far at least as producers are concerned, but it is hoped that there will soon be a change for the better. Discounts for large lots may be quoted at 60&5 to 65, straight. The Allegheny Valley Rolling Mill, located at Kittanning, Pa., was sold by the sheriff on the 27th ult., for $20,100. It was bid in by J. E. Brown, James Musgrove and John A. Colwell. It has been in trouble for some time past, and it is hoped that all the difficulties have been adjusted, and that it will soon be started up again.

The *Commercial*, of 6th inst., says: The business for the week in raw Irons has been light. Receipts continue liberal. Increasing inquiry is making by consumers preparatory to a resumption of operations. Stocks of raw Iron, although not heavy, are fully equal to any favorable early demand. The mills generally have very light stocks on hand, and scarcely any contracted ahead. Things can't remain in this situation much longer, and when this market does open, lively times may be expected. Bar Iron remains unchanged. Nails, since our last issue, have been reduced 37½ cents per keg. This movement will, no doubt, cause an improved demand and an active market. The sales reported were as follows:

BITUMINOUS COAL SMELTED FROM LAKE SUPERIOR ORE.

200 tons gray forge	$34 00—4 mos.
100 tons, a mixed lot	33 00—4 mos.
70 tons, a mixed lot	32 50—4 mos.
50 tons foundry	37 50—4 mos.
100 tons gray forge, at furnace	34 50—4 mos.
100 tons gray forge red short	35 00—4 mos.
50 tons gray forge red short	35 00—4 mos.
80 tons coke No. 1 foundry iron from native ore	37 00—4 mos.

ANTHRACITE.

70 tons No. 1 foundry	$40 00—4 mos.
50 tons gray forge	34 00—4 mos.
50 tons gray forge	34 50—4 mos.
50 tons foundry	38 00—4 mos.
260 tons Chickies gray forge, at furnace, to go west	33 00—cash.
160 tons Chickies forge, at furnace, to go west	34 00—cash.

CHARCOAL.

45 tons No. 1 Hanging Rock	$50 53—4 mos.
34 tons No. 2 Hanging Rock	46 00—4 mos.
10 tons cold blast	68 00—4 mos.

BALTIMORE.

Messrs. WYETH & BROTHER, Iron and Steel merchants, corner of South Charles and Lombard streets, report us the following prices, under date of Sept. 9, 1873: Business continues fair, with growing inquiry for immediate requirements. Quotations rule firm and unchanged; stocks light, with absence of many leading sizes:

AMERICAN REFINED BAR IRON.

1 to 6 wide by ⅜ to 1 thick.... } 1 to 4½ wide by 1½ to 2 thick.. }	3¾c. to 4c. per lb.
Round and square, ordinary sizes, from ¾ to 2 inclusive	3½c. to 4c. "
Hoop Iron, 1¼ wide and upward	5¼ to 5½c. per lb.
Band Iron, from 1¼ to 4 in. wide	4½ to 4¾c. "
Horse Shoe Iron ¾ to 1 wide by ⅜ to ½ thick	5 to 5½c. "
Norway Nail Rods	8½ to 8½c. "
Black Diamond Cast Steel, Flats, Squares and Octagon, ordinary sizes	17c. "
Machinery Steel	13c. "
Cast Spring Steel	11c. "
Homogeneous Steel Plate	13c. "
Perkins' Horse Shoes, per keg of 100 lbs	$6 37½
" Mule Shoes " "	7 37½

Common Horse Nails, from 14c. to 18c per pound.

10 9 8 7 6

Putnam Horse Nails..23 24 25 26 28c. per lb.
R. R. Spikes.....5½ by 9-16 at 4¾c. to 5c. per lb.

CINCINNATI.

Messrs. ADDY, HULL & Co., under date of Sept. 8, write us as follows: The demand continues fair, with free receipts. There is more inquiry for Forge Irons, but bids are on a low basis:

HOT BLAST CHARCOAL.

Hanging Rock No. 1	$47 00 @ 48 00—4 mos.
" " No. 2	43 00 @ 45 00—4 mos.
" " Forge	35 00 @ 36 00—4 mos.
Tennessee No. 1	44 00 @ 46 00—4 mos.
" Forge	35 00 @ 36 00—4 mos.
Alabama No. 1	47 00 @ 50 00—4 mos.
Missouri No. 1	49 00 @ 56 00—4 mos.
" No. 2	44 00 @ 45 00—4 mos.

HOT BLAST STONE COAL.

Missouri No. 1	$46 00 @ 47 00—4 mos.
" Forge	35 00 @ —4 mos
Ohio No. 1	42 00 @ 44 00—4 mos.
" Forge	34 00 @ 35 00—4 mos.
Scotch Pig, No. 1	

COLD BLAST CHARCOAL.

Hanging Rock Car Wheel	$60 00 @ 65 00—4 mos.
Missouri " "	60 00 @ 62 00—4 mos.
Kentucky " "	58 00 @ 60 00—4 mos.
Tennessee " "	58 00 @ 60 00—4 mos.
Georgia " "	60 00 @ 63 00—4 mos.
Alabama " "	60 00 @ 63 00—4 mos.
Machinery and Forge	58 00 @ 60 00—4 mos.
Blooms	112 00 @ 115 00—4 mos.

WILLIAM MEANS' report of the iron market for the month of August is as follows. The shipments represent probably one-half of the iron sold in Cincinnati, the other half being shipped direct from furnaces:

CINCINNATI, Sept. 3, 1873.

There was no material change in the Pig Iron market during the month of August. Prices of all grades of Hot Blast declined a little, and toward the close of the month the movements in the market indicated a lightly increased demand, but not sufficient to foreshadow better figures than are now prevailing. A sale of about 4 00 tons of Foundry for future delivery, by the proprietors of two furnaces, comprises the only round lot which changed hands during the month; but the figures were hardly up to present quotations. Some of the furnace men were excited over this transaction as the harbinger of an early advance; but the facts, so far, do not warrant their expectations. Car wheel metals remain at the quotations, but are carefully scrutinized. Forge Irons continue to droop, but are not so abundant as a few weeks ago. What may be the future of the Pig Iron market we do not even pretend to guess. The war between capital and labor in Great Britain, producing higher prices there, relieves home producers from all fear of noticeable importations; but the rapid development of new enterprises at home and the reduced demand here, seem to counterbalance any disposition to higher figures in the United States. The receipts of Pig Iron during the month were by river, 3137 tons; by railroad, 4950 tons, and the shipments, by river, 181 tons; by railroad, 5678 tons.

LOUISVILLE.

Mr. GEO. H. HULL, under date of Sept. 8, writes us as follows: Inquirers for Foundry Irons have been a little more frequent for the past week, but the market continues dull, as consumers are still buying from hand to mouth. The usual time, four months, is allowed on quotations below:

HOT BLAST CHARCOAL.

No. 1 F'dry, from Hanging Rock Ores	$48 00 @ 50 00
" 2 " " " "	45 00 @ 46 00
" 1 Forge, " " "	37 00 @ 38 00
" 1 F'dry, from Tennessee Ores	48 00 @ 50 00
" 2 " " "	44 00 @ 45 00
" 1 Forge, " "	36 00 @ 38 00
" 1 F'dry, from Alabama Ores	48 00 @ 50 00
" 1 " " Iron Mountain Ores	50 00 @ 52 00

HOT BLAST STONE COAL.

No. 1 F'dry, from Missouri Ores	45 00 @ 46 00
" 2 " " " "	41 00 @ 43 00
" 1 Forge, " " "	35 00 @ 36 00

COLD BLAST CHARCOAL.

Car Wheel from Hanging Rock Ores	60 00 @ 65 00
" " Tennessee Ores	58 00 @ 60 00
" " Alabama Ores	60 00 @ 62 00
" " Georgia Ores	60 00 @ 62 00
" " Missouri Ores	58 00 @ 60 00
" " Kentucky	56 00 @ 62 00

BOSTON.

SEPT. 6.—The market for refined Bar Iron is improving slowly, and there is a stronger feeling, though the demand continues to be quite moderate. Low grades of Pittsburgh Iron continue to be sold at very low rates, in some instances at $82, but best grades of American and English are held steadily at from $85 to $90. We hear of contracts for common sizes being placed in near-by mills at $85, to which must be added, when it is bought from store, at least one profit, and cost of carting. The market for Scotch Pig is considerably firmer, owing to reports of an advance abroad, and we quote from $1 to $2 a ton higher than last week. The demand is light. American Pig is steady, and selling at recent quotations. We quote yard lots of American Pig iron at $45 to $50 per ton, including No. 2 extra at $45 to $46, and No. 1 at $47 to $50. We quote Eglinton at $49 to $50. Coltness at $58 to $60, Gartsherrie at $57 to $59, Charcoal at $60 to $70.—*Com. Bulletin.*

GERMANY.

(Borsenhalle.)

HAMBURG, Aug. 22, 1873.—*Metals* are, on the whole, inactive. German *Lead*, 25 to 26 marks; Northern *Copper*, 94 to 105; Banca *Tin*, 1·50; English, 1·40 to 1·45; Rods, 1·42½ to 1·45; *Spelter*, 26.

(Handelsblatt.)

BERLIN, Aug. 27, 1873.—*Iron.*—Iron industry in Prussia, although to a considerable degree stagnant at present, will, no doubt, soon revive. Consumption of Wrought Iron going on undiminished. The furnaces in *Upper Silesia* are comparatively, if not altogether, independent of Coal from other regions, especially foreign, inasmuch as they possess their own Coal mines, which produce Coal at a moderate cost. It is all nonsense to talk about the replacing of Iron by Wood and Spelter. Nor should it be forgotten that of Rails and Railway material enormous quantities will again be immediately required, for the extensive constructions resolved upon throughout Prussia will be taken in hand without further delay. Although we admit that while Germany and France were preparing for the late war they may, for military purposes, have absorbed unusually large quantities of Iron, it should not be forgotten that the revival of industry since we have peace has been on a gigantic scale, and that the present lull is due merely to a reaction in speculation. The speculative inquiry has been paralyzed, but real consumption is going on unabated. Overproduction of Iron is, for a long time, impossible, in either Europeor the United States.

HOLLAND.

(Koch & Vlierboom.)

ROTTERDAM, Aug. 26, 1873.—*Tin* is lifeless. A few sales have transpired of *Banca* on the spot at 79 guilders and 78½, while *Billiton* afloat has sold at 76.

BELGIUM.

(Revue Industrielle.)

CHARLEROI, Aug. 25, 1873.—*Coal.*—The general opinion in the coal regions of Belgium is that coal of all qualities will be scarce throughout the winter. The extensive transactions that have taken place leave on hand but a reduced stock, and unless an increased production can be brought about, a great many requirements cannot be attended to.

(Moniteur des Interets Materiels.)

BRUSSELS, August 23, 1873.—*Coal.*—The strike between consumers and producers of coal continues, and chances decidedly point in favor of the former, importations from Germany and England being more active than ever. We have stated on former occasions that many coal companies of the Liege region had been and are making secret concessions, while publicly the old high prices are maintained. A general break down in coal values would have long ago occured there but for field labor during crop time withdrawing many extra hands from mining. Charleroi still quotes 28 francs for greasy coal, and 22 for small coal, nominally. Coke continues on the downward track, and is now 40 francs. *Iron.*—The great event of the week has been the British Iron and Steel meeting at Liege. All the iron masters of Belgium were there, too, and the Belgian works throughout the country have been anxious to show our friends from across the channel the present state of their establishments. A slight improvement in the general aspect of Iron matters is observable in Belgium. Iron is nominally sustained at 280 francs. Concessions made are between numbers, and thus, so to say, private. Although Cast Iron is not active, and not likely to improve much, a good increase of orders seems to be at hand. The Couillet Company has extinguished its fires for the time; a good many rolling mills, on the other hand, will, we expect, resume work. The duty modifications in Germany are thought to promise some activity among us, and the eventually inevitable decline in Coal will assist a great deal in reviving matters.

FRANCE.

(Moniteur des Interets Materiels.)

PARIS, Aug. 24, 1873.—*Coal*—Nothing of particular interest is noticeable in the French Coal market. The arrivals of English and German coal continue with steadiness. We are informed by the *Houille* newspaper that some 100,000 tons of Coal have again been contracted for in England, at prices so low as to knock the bottom out of the inflation in Belgium and the North of France. Coal arrivals by rail are plentiful, but river navigation furnishes us little thus far. Meanwhile, the Northern and Pas de Calais mines keep up prices as high as ever—between 32 and 35 francs. *Iron* here is not in a favorable position. Rolled Iron has slightly given way, No. 2 prime quality ranging between 310 and 320 francs; Wrought Iron between 315 and 350. Cast Iron for building purposes is also tending down between 310 and 340. Old Iron quiet at 160 to 190. *Copper* has been slightly looking up in England. The late shipments from, and charters at, Valparaiso were light, owing to the scarcity of bottom, but a fleet is on the way now, and there will soon be plenty of vessels on the Chilian coast. Liverpool has also been rather improving. The stock at Liverpool and Swansea of West Coast Copper in first and second hands is 23,600 tons of pure Copper, against 18,200 in 1872, and 18,900 in 1871. At Paris little doing at 215 francs for Bars and 220½ for Ingots. In Germany Copper is upheld with difficulty. Berlin is 30½ to 31½; Stettin, 31 to 32. *Tin*—Quite extensive importations of Australian Tin at the English ports have lowered the position of Straits and Banca there. Holland is weak, with a pressure to realize. Berlin is steady at 44½ to 45½. At Stettin Banca is 48; English, 45 to 46. *Lead* is firm, without much doing anywhere; yet there is little or no chance, apparently, for a decline at any point. Berlin is 8¼ to 8½; Stettin, 8 to 8½; Paris, 57 to 59; St. Petersburg, 29 roubles the 164 kilos. *Spelter* has undergone few variations. The demand at Liverpool is light. London has been ranging between £25¼ and £27, the former for Gladbach and the latter for W. H. at Hull. Paris without any movement and unchanged. Berlin is weaker. Breslau, the leading market, is altogether nominal.

EAST INDIES.

(Ernsthausen & Oesterley.)

CALCUTTA, August 25, 1873.—*Metals.*—English Tile *Copper*, 33·4; Braziers, 38·4; real Silesian *Spelter*, 19·4; *Yellow Metal*, 32·4.

CHINA.

(Arnhold, Karberg & Co.)

HONG KONG, July 18, 1863.—Nail Rods have continued to attract a fair degree of attention during the early part of the past fortnight, and fully former rates have been paid. Latterly, however, the business has been somewhat quieter in tone, owing to the cessation of the demand for the Northern markets. Stocks appear to be very light, and the probability is that present rates will be maintained. English Bar Iron has attracted no notice, and there is not a sale to record for the present mail. Soft Bars are again held for higher rates, but we have not heard of any settlements. Hoops are quiet. The demand for Iron Wire has subsided, but prices are unchanged and steady. For Steel there has been no inquiry. *Lead.*—The lull in the demand noticed in our last issue was of short duration. Foreign speculators have again bought freely for shipment to Foochow, paying $7·10 for L. B., to which brand they have more especially directed their attention. At the close the market is rather quieter, but holders are firm. Tin Plates are difficult to move, and prices, if anything, are easier. Tin is quoted 50 cents per picul higher, and readily saleable. Quicksilver would meet with a ready sale at a further advance of $3 to $4 on our last quotations, but there appears to be none on offer. A few hundred flasks have been settled to arrive within two months, at $135 per picul. Yellow Metal unchanged. Coal dull and unaltered; sales 1000 tons Cardiff at $12, and 1000 tons English at $10¼ per ton. We quote American Anthracite, $9 to $10; Sydney, $8½ to $8¾; Keelung, $6 to $7, and Japan, $7½ to $8.

SOUTH AMERICA.

(H. Fischer & Co.)

VALPARAISO, (Chili), Aug. 1, 1873.—*Copper.*—In Bars but an insignificant business has been done, no Guayacan and Lota being on offer, and but small parcels being placed upon the market here. The price of $17¾, cash, was sustained only till the 21st ultimo, when telegrams from England, dated 20th of June, came to hand, quoting £30, causing a decline here to $17½ to $17⅝. At the latter figure the market closes firm to-day. Of *Regulus*, a cargo was sold. Nothing has transpired in *Ore*. Sales of Bars, 13,771 quintals, at $17½ to $17¾, and 15,400 quintals, Regulus, at $7·70, on board, at Chanaral. We quote Bars, cash, on shore here, $17½. There would be purchasers of Guayacan and Lota, on board, at $18½. *Ore*, $3·15, asked; $2·90 to $3 per quintal, offered. *Regulus*, $7·70, on board. *Exchange*, 60 days, 41¾ to 44⅛; 90 days, 44⅛ to 44¾.

IMPORTATIONS.

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending September 9, 1873:

Hardware.

Boker Hermann & Co.
Mdse. pkgs., 22
Busch & Co.
Wire, cks., 8
Bloomfield J. C. & Co.
Arms, pkgs., 10
Dickinson Henry
Casks, 4
Field A. & Co.
Mdse. pkgs., 7
Packages, 40
Anvils, 4
Folsom H. & D.
Arms, cs., 9
Gilespie J. D. C.
Packages, 28
Hirsch L.
Casks 3
Jackson Wm.
Wire, bdls., 48
Lau & Garlichs,
Arms, cs., 14
Mdse. pkgs., 4
Merchants Dispatch Co.
Arms, cs., 6
Moore's J. P. Sons,
Mdse. pkgs., 86
Noyes, White & Co.
Per. caps, cs., 2
Robbins C. & Sons,
Mdse. pkgs., 1
Schoverling & Daly,
Mdse. pkgs., 4
Cases, 8
Spies, Kissam & Co.
Mdse. pkgs., 10
Sawyer John.
Wire rope, coils, 5
Turnor R. A.
Mdse. pkgs., 14
Van Wart & McCoy,
Cases, 20
Wilde S. & Son,
Packages, 9
Western Union Tel. Co.
Wire, lots, 136
Wiebusch F.
Chains, 13; cks., 96
Casks, 2
Packages, 4
Witte John G. & Bro.
Mdse. pkgs., 2
Ward Asline,
Mdse. pkgs., 6

Iron.

Congreve Chas. & Son,
Rails, 703
Fish plates, bdls., 2100
Darrel & Co.
Wrought scrap, pcs., 71; scrap, cks., 13; bbls., 16; tons, 8
Drexel, Morgan & Co.
Bars, 68
Griswold J. A. & Co.
Pig, tons, 198
Henderson Bros.
Pig, tons, 400
Lang W. Bailey & Co.
Mdse. pkgs., 10
Mallory H. & Co.
Scrap, pkgs., 154
McColl Duncan,
Scrap, cks., 4
Naylor & Co.
Mdse. pkgs., 550
Page E. & Co.
Bars, 121
Reynal & Co.
Scrap, tons, 15
Salomon II & Co.
Scrap, pcs., 11
Vose, Dinsmore & Co.
Bars, 525
Order
Pig, tons, 550
Scrap, tons, 93
Bars, 5512

Steel.

Cockayne J. W.
Cases, 11
Bundles, 3
Bars, 24
Drexel, Morgan & Co.
Rails, 935
Dugill Chas.
Cases, 8
Casks, 3
Bundles, 10
Hogan John.
Mdse. pkgs., 46
Jackson, Wm.
Bundles, 8
Naylor & Co.
Rails, 1827
Pickhart W. & Kutriff,
Bundles, 162
Smith G. A. & Co.
Old spring, tons, 50
Vose, Dinsmore & Co.
Mdse. pkgs., 2
Wardlow W. C.
Cases, 5
Bundles, 338
Bars, 19
Order.
Bundles, 57

Metals.

Brown Bros. & Co.
Plumbago, bbls., 950
Darrell & Co.
Brass, bbls., 4
Scrap, copper, bbls, 1
Scrap, composition, cks., 5
Goodwin & Rice,
Tin plates, bxs., 500
Hoxton B.
Lead, pigs, 1000
Harley Geo.
Bales, 2
Hart Lucius & Co.
Tin, slabs 150
Lanman & Kemp,
Tin, bars., 30
Lamarche H.
Zinc, bbls., 58
Moore's J. P. Sons,
Black lead, cks., 4
Noyes C. S.
Copper, bxs., 1
Lead, pcs., 31
Brass, bxs., 1
Nichols J. M. & Co.
Tea lead, cs., 10
Phelps, Dodge & Co.
Tin, slabs, 553
Tin plates, bxs., 1179
Rulon J. W. & Son,
Plumbago, bbls., 54
Salomon A. H. & Co.
Scrap, copper, bbls., 4; pcs., 139
Scrap, brass, bbls., 3
Scrap, lead, bbls., 3; pcs., 100
Wessels, Geo.
Scrap, bxs., 1
Order.
Tin, ingots, 300
Tin plates, bxs., 2172
Plumbago, bbls., 706

The London Times on the Iron Trade.

The following is the leading editorial from the London *Times*, of August 29th, of which a brief summary was forwarded by cable on that date:

The Iron trade of the United States has grown late, but vigorously. Its recent development must be encouraging to the native manufacturer, and, though it has cost us dear, it may serve to teach us one or two useful lessons. The facts, an account of which appeared yesterday in our American correspondent's letter, are as follows: The American ironmasters have long enjoyed the advantages of a protective system, established in order to enable them to compete on equal terms with the foreigner. England has the ready means of manufacturing iron and steel much more cheaply than America, and could afford to send them across the Atlantic and, with the freight thus added, to undersell her American rival; and even when to the cost of carriage was added a further heavy duty on importation, the native manufacturer, who was subjected to no such disadvantage, did not find the tables turned altogether in his favor. He was enabled to put into his pocket some profits which otherwise would have gone abroad. English iron was made dear, but it was not excluded. The protective tariff, it had been hoped, would prove in the event prohibitive. But English manufacturers were found able, in spite of it, to undersell the American on his own ground. Of the commoner kinds of iron which were used in the United States the English sent about one-half, and of the more finished products of skilled labor about four-fifths. Up to 1871 this proportion continued; but from that date onward the change has been remarkable. Step by step the Americans have obtained possession of their own market. In 1872 we were actually undersold, and an immense impulse was given to the American native industry. All over the Pennsylvanian iron district there were signs of a newly created life. Furnaces were kindled, rail mills and rolling mills were everywhere erected. A new prospect, which he had never dreamt of, seemed opening out to the American manufacturer. If he were now to make a vigorous effort, he might dislodge his English rival; and the hopes thus formed were not destined to be disappointed. One of the finest markets we ever possessed has been gradually closed to our goods. The demand for our iron has greatly decreased, and Americans are found to buy only what they have not as yet the means to supply themselves with at home. The statistics of the year 1873 tell their own tale. In the first half of 1872, when our trade had already slackened, we still found a sale in America for 444,000 tons of iron. In the same period of 1873 we sent only 228,000—as nearly as possible one-half of the year previous. But the price we obtained for the entire amount imported was reduced only by one third. We had charged in 1872 about £9 a ton for iron in America; in 1873 we charged £12, and the result is that Americans can produce their iron more cheaply at home. But this has not ended our disasters. The American manufacturers have carried the war still further, and, without the aid of any protective tariff, are competing with us successfully in the Canadian and South American and West Indian markets. A change may come before long, but in the meantime we have been losing our customers; and such possessions are lost more easily than they are recovered.

Trade is a very delicate thing, and it is very easily disarranged. It depends upon many causes which are not obvious to trace, and its rules may be often ignorantly, but none the less disastrously, broken. It is often impossible to determine why business has shifted from one locality to another, or to see why certain centers of industry flourish while others fail and are neglected. But with the English iron trade it does not appear that there is much room for mystery. It may prove very hard to regain, and may perplex our most intelligent efforts; but it is perfectly obvious why we have been losing it. We had overcome the difficulties of distance and of unequal dues, and we kept our business in spite of them as long as we could produce iron cheaply. We are losing it now because our iron is no longer cheap. And it is not only in America that the same causes have been producing the same results. The notion that France or Belgium or Germany could ever compete with us on our own shores could not, a few years ago, have been even seriously discussed. But the event none the less has happened; and we have no assurance that the process of decline thus commenced can be considered by any means as ended. What has happened already in the case of iron may soon happen, from the same reasons, in other and equally important industries. Our trade in iron is only the first affected. Its price depends very materially on the price of coal. Anything that raises coal will raise iron too; and a rise of iron must mean in the end a rise of everything for which iron is in any way employed; and when this rise has been effected it is difficult to see what will be excluded from its operation. Now, without pronouncing judgment on the disputed question whether strikes have been the exclusive cause of the late rise of coal in England, we may take it as granted that they have been a very principal cause, and that they are now exercising a controlling influence in keeping up the admittedly excessive price. In the opinion of the mine laborers, high prices mean high wages, and they are determined, accordingly, that prices, at any cost, shall be kept up. The owners are not to be permitted to accumulate large stocks, and the amount produced is always to be kept just below the demand, so that a further contraction of supply may be at any moment possible and effective. In this way the result desired is brought about. Coal continues to be dear, iron is dear correspondingly, and everything else tends to rise in price and to be grown or manufactured with difficulty and expense. The rise of coal has thus commenced by driving away our trade with the United States, and it will end by driving us out of every market in the world, and will leave us stranded at home if the causes which have produced it continue still to operate. Higher wages and less work must, if continued far enough, produce their natural consequences. We cannot idle, and sleep, and waste money, and compete with other nations which are thrifty and active and intelligent. The Americans have had to contend with us under immense natural disadvantages; but they have beaten us nevertheless, and we have no one but ourselves to thank for it. It is not only high wages that have increased the cost of production; we have to take further into account the loss of time, the uncertainty, and the general disorganization which continued strikes must necessarily entail. We have great natural advantages on our side, but we have lost a great part of the benefit of them by the perverse misconduct of our so-called working classes.

The lesson this should teach us is not obscure, but there is danger, nevertheless, that all its teaching will be thrown away. Experience has shown how very difficult it is to deal with bodies of workmen. It is not only that they are ignorant, and selfish, and suspicious, and inclined to suppose a fallacy in any argument that does not appeal directly to their lower instincts; this would already make it hard enough to induce them to abandon their career of mischief. But what was hard becomes absolutely impossible when they are no longer free agents—when they have surrendered their individual responsibility, and are acting under the control of the worst class of professional agitators. To neither the men nor their leaders should we venture to speak of right, or duty, or the prosperity of the country, or a regard for others, even of their own class. For all this they have, and they profess to have, a cynical disregard. They have made up their minds to do what they believe others are doing, and to consult only what seems to them their own interest. It suits them that prices should be high, and high, accordingly, they are determined they shall be. Trade may be destroyed, masters ruined, men in their own class of life may be pinched for want of fuel, but if they can keep up the value of coal and the wages of coal-diggers they care, and they profess to care, for nothing else. To these men there is but one appeal possible—the appeal to interest. It may be pointed out to them that they are consumers of fifty things and producers only of one, and that, if prices are raised against them all round, it will be of little use that the amount of their wages has been increased. It is only when trade is brisk that strikes are likely to be successful; and their direct result has been to ruin the prosperity which alone has made them possible. Workmen know well the ruin entailed upon them when trade really fails—the starvation of East London when they had at last succeeded in driving away iron ship-building from the Thames—the widespread misery to themselves that waits upon a commercial crisis. What would be their position if our entire trade could be carried on at a disadvantage—if we were to raise prices all around and to lose our foreign markets—if the laboring man had to pay more for his clothes and food and firing, and could earn less money because there were fewer customers for his productions? It is a dismal prospect, but it is to this that trades' unions are leading us. Some cure must be found for the evil before they have made all cure impossible. If the men are neither free to do what they think right, nor intelligent enough to perceive what is for their good, a remedy must be sought in the concerted action of the masters. The state is one of war, and it must be met and dealt with accordingly. Public opinion, too, must declare itself with due firmness; and public opinion is an important influence in England for the side on which it so declares itself. Strikes must continue to be permitted by the law, but it must never be forgotten that they are vicious in themselves and ruinous in their results; and this view of them must be steadily maintained in speech and action and legislation. The teaching of our iron trade with America is too valuable and too costly to be thrown away.

The Neville Furnace.

In *The Iron Age*, of June 12th, we published, with illustrations, a description of the Neville furnace for the manufacture of malleable iron direct from the ore. The Portage Lake *Mining Journal* gives the following figures, showing the cost of plant and operating expenses, based upon the results of one month's operation of the furnace, erected on the Neville system, at Greenville, N. J.:

The plant consists of

Furnace	$3,000
Steam hammer	2,000
Blower	300
Engine and boiler (second hand)	800
Crusher and rolls	600
Shafting, tools, etc	800
	$7,500

This plant, however, would answer for three furnaces, with little extra expense, as three furnaces with necessary machinery and buildings, would cost not exceeding $15,000, and adding rolls, etc., for roughing and finishing, $25,000.

Each furnace requires fire brick, say	17,000
Common brick	6,000
Cast iron	11½ tons
Wrought iron	2½ tons
Labor and sundries	$600

Each furnace requires four men to a turn, viz.:

One puddler	$4 00
One helper	2 00
One fireman	1 75
One ovenman	1 75
Wages for one furnace for one turn	$9 50
For twenty-four hours	19 00
Or for three furnaces	$57 00
Wages for two engineers at $2 25	$4 50
Wages for two mixers, 1 75	3 50
Wages for one crusher, 1 75	1 75
Wages for two shingiers, 3 00	6 00
Wages for three laborers, 1 75	5 25
	$21 00
Total wages for three furnaces, 24 hours	$78 00
Coal for three furnaces and mixing 10 tons, at $4	40 00
Ores for same, averaging 55 per cent., 18 tons, $3	54 00
Royalty, $2 per ton	15 00
Interest and depreciation, $1 per ton	7 00
Total cost 7½ tons bloom per day	$194 50
Value of same, at $70 per ton	525 00
Profit per day	$330 50

Estimates of ore and coal will vary above and below that given, according to locality. As the only power used is for running the crusher and blower, in case of available power the first cost and after running expenses will be less than the estimate.

In charcoal burning districts estimates can be taken as follows:

Wages for three furnaces	$78 00
2000 bushels charcoal, at 10 cents	200 00
Ores	54 00
Royalty, interest, etc	22 50
Total cost 7½ tons charcoal blooms	$354 50
Value of same	937 50
Profit per day	$583 00

The ball from the reverberatory can be either hammered into a "bloom" or squeezed and rolled the same heat into a "muck bar."

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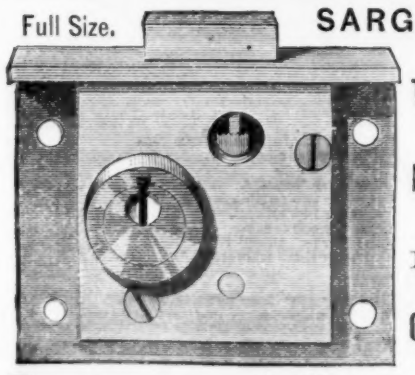

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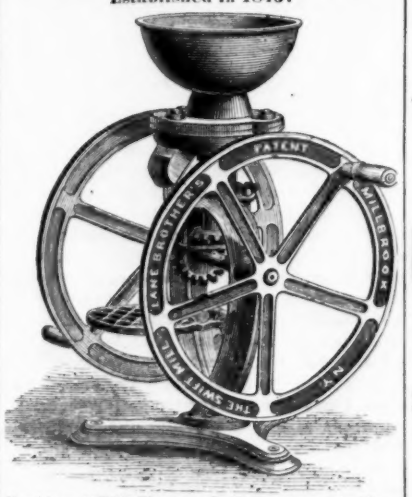

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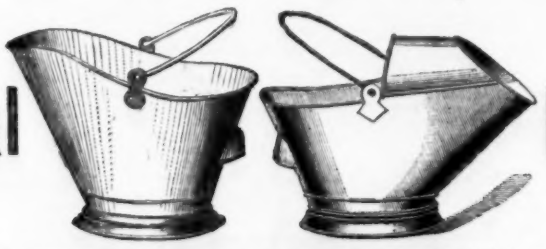

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With or without Convex and Concave Washers.

Jackscrews, Braces, Coffee Mills, Turning Lathes; Clamp Heads and Screws; Parallel Bench Vises, Sash Pullies, Ho House Pullies, Composition Cocks, Bench Screws, Vise Screws Gridirons, Drill Stocks and Bows, Box Chisels, Rivets, Sheaves, Block Pins, Composition Roller and Iron Bushings, Riggers' Screws, Caulkers' Tools, Pump Chambers, Belaying Pins, Marlin Spikes, Malleable Iron Castings, and Genera Hardware.

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WILSON MFG. COMPANY,

Warehouse 37 Chambers St., N. Y.

EMMET HAMMER CO.,

Manufacturers of all kinds of

HAMMERS AND SLEDGES AND CONTRACTORS TOOLS,

BROOKLYN, E. D., NEW YORK.

WEST POINT FOUNDRY,

Established 1817. COLD SPRING, N. Y.

Paulding, Kemble & Company,

Office 30 Broadway, New York; Works at Cold Spring, Putnam Co., N. Y.

Steam Engines, Boilers & Heavy Machinery of all kinds, and Heavy Forgings.

FORD'S PATENT STOVE, for heating Air for Blast Furnaces.

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NAPIER'S PAT. DIFFERENTIAL CLUTCH, for starting and reversing Heavy Machinery.

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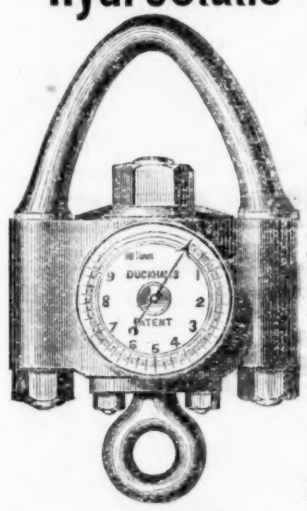
Castings from Gun Metal, guaranteed 30,000 pounds per square inch.

DUCKHAM'S PATENT

Hydrostatic Weighing Machines

AND

DYNAMOMETERS,



Capable of Weighing from 10 Cwt. to 100 Tons and Upwards.

Some purposes to which it can be applied.

(FIRST.)—As a Weighing Machine generally.

(SECOND.)—For ascertaining the correct weight of materials before, and continuously during manufacture at the furnace, cupola or forge.

(THIRD.)—As a Dynamometer, to test the strength of Anchors and Cables; the strain on Ropes or Structures; the power of Machinery; the Traction Power on Land and Towage Power at Sea.

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15 Gold Street, New York,

Sole Agents for Manufacturer in United States.

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Mfrs. of Hammers, Edge Tools, Railroad, Machinists' & Blacksmiths' Tools,

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Unfinished Picks	$ 8·50 per doz
Finished Picks	10·00 per doz
Finished Swedish Iron Picks	12·00 per doz

Established 1836.

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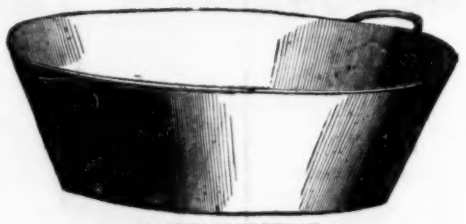

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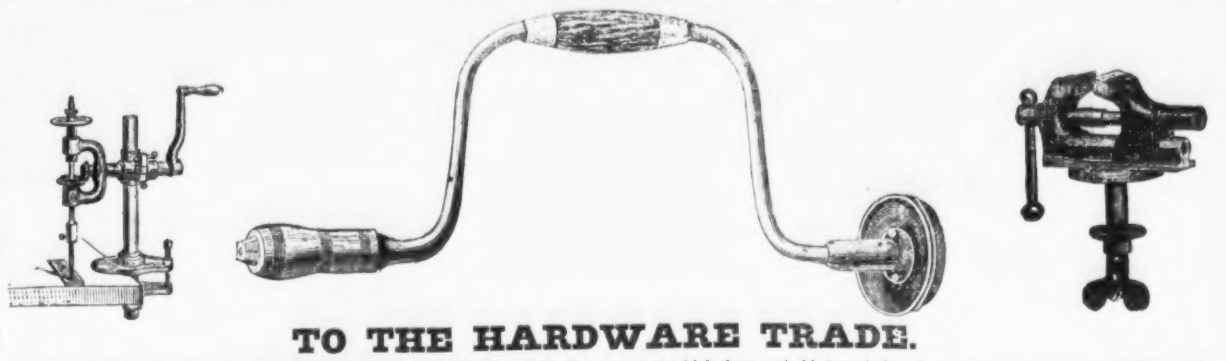


TO THE HARDWARE TRADE.

The great popularity of the **BARBER BIT BRACE,** and the firm prices at which they are held, have induced several manufacturers to infringe our patents, and offer an inferior article at a less price. As to the infringement, we shall at present only trouble the manufacturers. As to cheaper goods at a lower price, we say to our customers, if you really want them we can make them of any desired quality and price. But up to the present time we have steadily improved our goods and have sold them as low as such goods could be afforded. The actual cost of our braces is at least 20 per cent. more than those which are offered in the market at 5 per cent. less than ours. At present we are able to hold most of our trade, and we shall continue to improve our goods and sell a reasonable rates, while the hardware trade continues to support us in so doing.

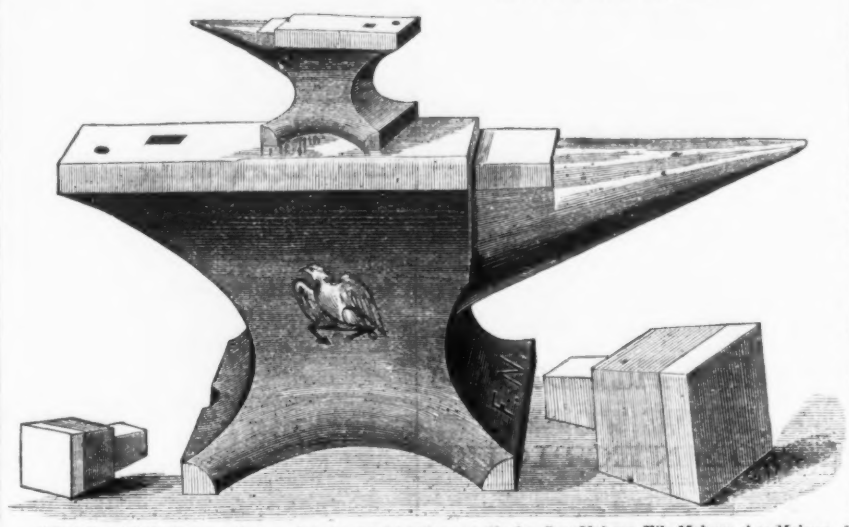
MILLERS FALLS CO.,

78 Beekman Street, New York.

ALSO MANUFACTURE PARALLEL VISES AND DRILLING MACHINES.

The Fisher & Norris Eagle Anvil Works.

(ESTABLISHED 1843.)



These Anvils are manufactured at the oldest Anvil Factory in this country, and for the past twenty-five years have maintained an excellent reputation among Blacksmiths, Machinists, Tool Makers, &c. They are *superior* to the best English, or other Anvils, on account of the peculiar process of their manufacture (invented and used only by this concern), and from the quality of the materials employed.

The working surface is in *one piece* of JESSUP'S BEST TOOL CAST STEEL, which, after being accurately ground, is hardened and given the proper temper for the heaviest work. The *horn* is covered with and its extremity made *entirely of steel*. The body of the Anvil is of the strongest grade of American iron, to which the cast steel face is *warranted to be thoroughly welded and not to come off.*

The best of English Anvils, after a time, become hollowing on the face by continued hammering in use, on account of the fibrous nature of the wrought iron—causing it to "settle" under the face.

The body of the Eagle Anvils being of crystallized iron, no such settling can ever occur; and the steel face, therefore, remains perfectly true. Also, it has the great advantage that being of a more *solid* material, and consequently with less rebound, the piece being forged receives the full effect of the hammer, instead of a part of it being wasted by the rebound, as is the case from a wrought iron anvil. An equal amount of work can, therefore, be done on this Anvil with a *hammer one fifth lighter* than that required when using a wrought iron anvil which is more elastic.

FISHER & NORRIS manufacture also, to special order, Anvils for Saw Makers, File Makers, Axe Makers, &c; also, Copper Smiths', Silver Smiths' and Tinmen's Stakes and Blocks, with hardened and polished cast steel faces, and the well known Double Screw Parallel Vise.

PRICE LIST, May 1st, 1873.

ANVILS weighing 100 lbs. to 600 lbs., 12 cts. per lb.

Smaller Anvils, ("Minims.") No.	0	1	2	3	4	5	6	7	8	9
Weighing about	10 lb.	15 lb.	20 lb.	30 lb.	40 lb.	50 lb.	60 lb.	70 lb.	80 lb.	90 lb.
Price,	$4·00	$5·00	$6·00	$6·50	$7·00	$8·00	$9·00	$10·00	$11·00	$11·50

THESE GOODS ARE SOLD BY OUR AGENTS (with usual discounts to the trade).

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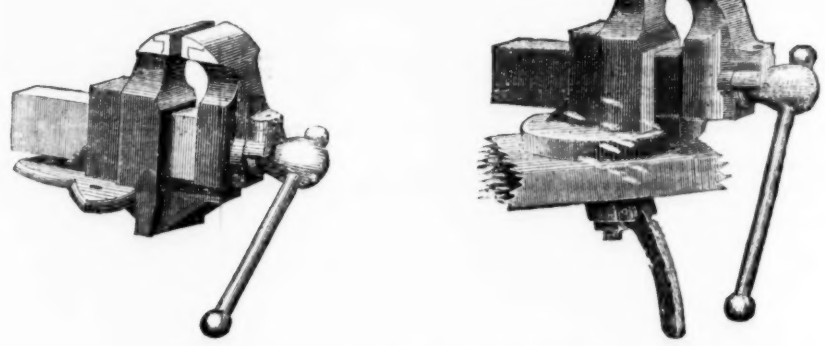
HOWARD

PARALLEL BENCH VISE.



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Sweet's Crow Bars,
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Wrought Barrel, Square and Shutter Bolts.

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Ball Braces, Bright Halter and Coil Chains, &c.

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Geo. Wostenholm & Son's Knives, Scissors and Razors, the largest stock in the U. S.

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We always have on hand a full assortment of

German and English Hardware, Cutlery, Guns, Gun Material, Chains, Heavy Goods.

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BUTCHERS' KNIVES,

BUTCHERS' STEELS,

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SHOE KNIVES.

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BUYERS ARE SPECIALLY CAUTIONED AGAINST IMITATIONS OF THE MARK, AND THE SUBSTITUTION OF COUNTERFEITS BEARING THE NAME, "WILSON," ONLY.

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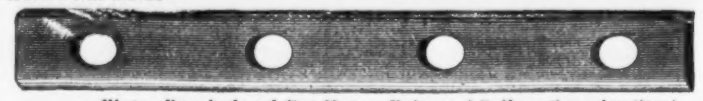
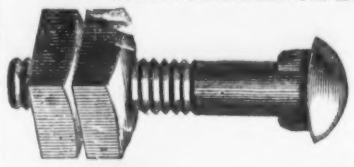
Manufacture **Bar, Angle, and Plate Iron, Spikes and Nails, Railroad Fish Plates, Bolt and Spikes, Railroad and Contractors' Supplies in general, Bolt Blanks, Coach Screws "Adams Nut Lock."**



Plates Punched and Cut Hot. Bolts and Spikes, Superior Stock



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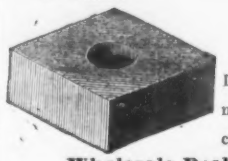
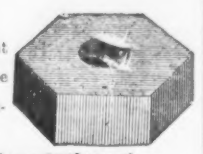
All sizes constantly on hand. We use the best Lake Superior Iron, and make a uniform handsome nut. Orders solicited. We make washers a specialty. Also





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National Horse Nail Company, POLISHED AND POINTED NAILS.	Shoenberger's HAMMERED HORSE SHOES.	PRATT & CO., BUFFALO HORSE NAILS, NUTS, WASHERS, Crow Bars, &c.
SHELTON CO., BED SCREWS, CARRIAGE BOLTS, TACKS, &c.	WOOLWORTH HANDLE WORKS, *Axe, Pick and Sledge HANDLES.*	D. H. GOODELL, Lightning & Turn Table APPLE PARERS.
Ten Eyck Mfg. Co., SLEDGES, *GRUB HOES,* HATCHETS, &c.	Woods Cutlery Co., Hot Water Proof TABLE CUTLERY.	ELEPHANT AXES, HATCHETS, EDGE TOOLS.
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FINE FLAT-KEYED LOCKS for all Purposes.

RIM and MORTISE STORE DOOR LOCKS,

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The Yale Lock Manufacturing Co.,

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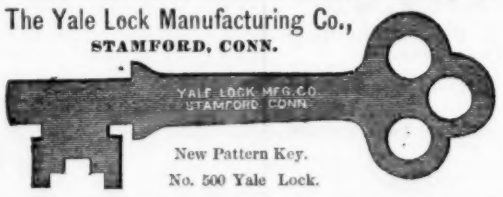
The Best TUMBLER LOCK Ever Made.



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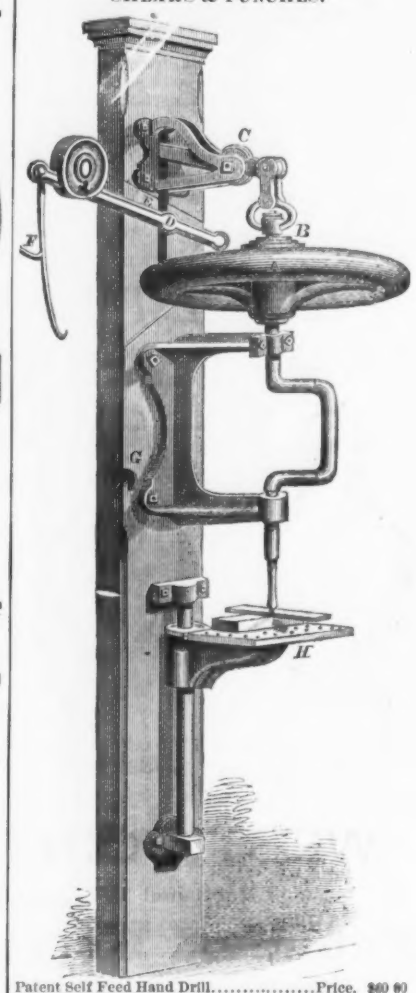
IMPROVED DRILL PRESSES, SHEARS & PUNCHES.



Patent Self Feed Hand Drill.....Price, $40 00
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Tools and Machines,

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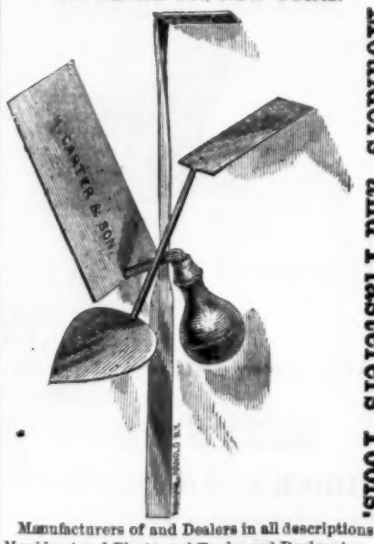
290 PEARL ST., NEW YORK.

Moulders' and Plasterers' Tools.



Manufacturers of and Dealers in all descriptions of Moulders' and Plasterers' Tools, and Dealers in General Hardware, Gilded Copper Weather Vanes, CARTERS' PATENT CARRIAGE LIFTING JACK, &c,

New York Wholesale Prices, September , 1873.

HARDWARE.

Anvils.
Solid Cast Steel.....₩ lb 11c
Wright's.....₩ lb gold 12c; over 250 lbs 12½c, gold
Armitage's Mouse Hole.....gold 12c
Wilkinson's.....₩ lb gold 11½c
Eagle Anvil Co. ₩ lb 12c.....dis 15 @ 15&5 %

Apple Parers.
Turn Table, Lightning, Conqueror.....$8·50 ₩ doz
Reading.....₩ doz 3 00
Union.....₩ doz 9 00
Bay State, Paring, Coring and slicing.....15 00 } dis
Skeleton " " " " .....9 00 } 5 %
Climax Slicer.....9 00
Bay State Peach Parer.....$11 00 @ 11 50
Lightning " " .....11 00 @ 11 50
Peach Stoner and Halver.....7 00

Augers and Bits.
Snell Mfg. Co.....dis 15 %
Russell Jennings.....dis 10 %
Douglass Mfg. Co., Extra.....dis 25 %
" " No. 1.....dis 25&5 %
" " Hollow Augers.....dis 25 %
Cushman's Expanding Hollow Augers.....dis 20&10 %
Ives'.....dis 25 %
" Hollow Augers.....dis 30 %
" Expansive Augers.....dis 30 %
" " Bits.....dis 25 %
Andrews' Bits.....dis 30 %
Cook's Patent Augers.....dis 30&10 %
" " Bits.....dis 25&10 @ 30&10 %
Shepardson's Double Cut Bits.....dis 20 %
Griswold's Patent.....dis 20 %
Cast Steel Cut Augers.....dis 30&10 %
" Auger Bits.....dis 20&10 %
Long Augers.....new list dis 30 %
Bonney's Patent Hollow.....$48 per doz—dis 25 %
Stearns' " " .....$48 per doz—dis 30 %
Morse's Bit Stock Drills.....dis 20 %

Axes.
Blood's.....$12 50 @ 14 00
Hunt's.....₩ doz $15 00 @ 17 50 net @ dis 5 %
Collins'.....₩ doz 12 00 @ 16 00 net @ dis 5 %
Hurd's.....₩ doz 12 50 @ 13 50
Schweitzer Mfg. Co.'s.....₩ doz 13 00 @ 15 00
Simmons'.....₩ doz 12 00 @ 13 50
Morris'.....₩ doz 12 50 @ 13 50
Red Jacket.....₩ doz 12 00 @ 12 50
Mann's.....₩ doz 13 00 @ 14 50
Powell Tool Co., "Peerless".....₩ doz 13 00 @ 14 50

Balances.
Chatillon's, Frary's, Morton's..... } new list dis 15 %

Bands.
Plated.....add 10 ; dis %
Iron.....dis 15&5 %
Brass (Plated list).....dis 5 %
Oroide.....add 15 ; dis 5 %

Bells.
Hand, Light Brass.....dis 60&10 %
White Metal.....dis 45&10 %
Globe.....dis 20 %
Swiss Hand.....dis 10 %
Abbe's.....dis 10&10 %
Taylor's Patent Door.....net
Western Gong.....net
Brook's Crank.....net list
" Pull.....dis 15 %
Hart Mfg. Co., Crank and Pull.....new list dis 50 %
Cow—Common Wrought.....new list dis 33⅓ %
Western.....new list dis 33⅓ %
Kentucky "Star".....new list dis 33⅓ %
Dodge's Genuine Kentucky.....new list dis 25 %
Yaw's Genuine.....dis 20 %

Bellows.
Blacksmiths'.....dis 10 %
Moulders'.....dis 15 %

Blind Fasteners.
Van Sand's.....₩ gross $1 00
Washburn's Patent.....₩ gross 1 00
Merriman's.....add 35 @ 40 %

Blind Staples.
Boardman's Patent, ½ in. and larger.....₩ lb 87½c
" ⅜ in....." 42 c

Bolts.
Cast Iron Barrel, Shutter, &c.....old list dis 50&10 %
Wrought Iron Barrel.....net
" " Square.....dis 10&10 %
Cardage and Tire, Common.....dis 70 %
" " " Norway Iron.....dis 40 %
Star, Philadelphia.....dis 40 %
Ezzie, Philadelphia.....dis 40 %
Philadelphia Pattern, P. S. & W.....dis 50&10 %
Carriage and Tire, R. B. & W.....old list dis 50&5 %
Plow, R. B. & W.....dis 30 %
Stove, R. B. & W.....dis 10 %
Union Nut Co.....dis 50&10 %
Machine.....dis 20 @ 25 %

Borax.—Per case of 100 lbs.....₩ lb 22½c

Boring Machines.
Kellogg's.....dis 10 @ 15 %
Snell Mfg. Co., Rice's Patent.....dis 15 %
" " Regular.....dis 15 %
Douglas Mfg. Co.....dis 20 %
Hovey's Angle.....$6 00 @ 6 22
" Upright.....4 25 @ 4 50
Mortising Machines, each.....$18 00

Braces.
Barber's Patent.....dis 40 %
Wilson Mfg. Co.....net @ add 5 %
Spafford's Patent.....dis 40 %
Noble's Patent.....dis 33⅓ %
Bartholomew's American Ball.....dis 10&10 %
" Patent Grip.....dis 40 %
Q. S. Backus & Co.....dis 30&10 %

Bung Hole Borers.
Common and Ring.....dis 20 %
Enterprise Mfg. Co.....dis 20 %
Ives' Tap Borers.....dis 20 %

Butchers' Cleavers.
Bradley's.....dis 15 %
Beatty's.....new list dis 10 %

2	3	4	5	6	7	8	9
$19·00	$21·50	$24·00	$27·00	$30·00	$33·50	$36·50	$40·00

Hart Mfg. Co.....dis 45&10 %

0	1	2	3	4	5	6
$25·25	$29·75	$30·25	$35·75	$43·35	$48·50	$54·00

Butts.
Wrought Brass.....new list dis 20 %
Cast Fast Joint, Narrow.....dis 40 %
" " Broad.....dis 40 %
Cast Loose Joint.....dis 50 %
" " Mayer.....dis 40 %
" " Parliament.....dis 40 %
Loose Pin.....dis 40&10 %
Wrought Fast Joint, Narrow.....dis 30 %
Wrought Broad.....dis 35 %
" Loose Joint.....dis 35 %
Wrought Table and Back Flaps.....dis 25 %
Cast Butts, Ohio Butt Co.—
Narrow Fast, Drilled and Wire Jointed (old list).....dis 20 %
Broad Fast, Drilled and Wire Jointed.....dis 35 %
Broad, Loose, Drilled and Wire Jointed.....dis 45 %
Silver Tipped.....dis 40 %
Loose Joint, Japanned.....dis 25 %
Loose Joint, Acorn and Silver Tipped.....dis 40 %
Palmer Blind Butts.....dis 30&10 %
Nicholson Blind Butts.....dis 40&10 %
Parker's Blind Butts.....dis 40&10 %
A. S. Parker's.....dis 40&10 %
Clark's Blind Butts.....dis 40&10 %
Clark's Blind Hinges, No. 30.....dis 30&10 %
Seymour's.....dis 40&10 %
Shenard's.....dis 40&10 %
Garretson's.....dis 40&10 %
Standard.....dis 40&10 %
Union Mfg. Co.—
Drilled and Wired Cast Fast.....dis 35 %
" " " " Loose.....dis 45 %
Loose Joint Japanned or Silvered Acorn.....dis 40 %
" " Figured Enameled.....dis 25 %
" " Nickel Capped.....dis 30 %
" " Solid Bronze.....dis 10 %

Caps—Percussion, per 1000.
G. D.....40c
Ely's E. ₩.....1-4s, 60c.; 1-10s, 67½c., gold
" Double Waterproof, 1-4s, $1·50; 1-10s, $1·57½c., gold
Colt's.....1-4s, 72½c; 1-10s, 82½c., gold

Cartridges.
Metallic.....dis 50 %

Cards.
Horse and Curry.....dis 25&10 %
Cotton.....new list dis 10&10 %
Wool.....new list dis 10&10 %

Casters.
Iron and Wood Wheel Plate.....new list dis 20&10 %
Brass Wheel Plate.....new list dis 20&10 %
Porcelain Wheel Plate.....new list dis 20&10 %

Chain
English Coil.....net gold

₩ lb.	13/16	¾	5-16	⅜	7-16	½
	9½	9	8½c	8¼	8c	

Trace, 6½-10-2.....₩ pair, gold, 60c
Trace, 7-10-2.....₩ pair, gold, 65c
Galvanized Pump Chain.....₩ lb 14c
German Halter Chain.....new list, gold, dis 25 %
German Coil.....new list, gold, dis 25 %
Jack Chain, Iron.....dis 25 @ 40 %
" Brass.....dis 20 @ 25 %

Chalk.
White.....₩ gross, 60c
Red.....₩ gross, 80c
Blue.....₩ gross, 90c
Crayons.....₩ gross, 14c

Cherry Stoners.
"Faulty".....₩ doz $9·00

Chisels.
Socket Firmers.....dis 60&5 @ 60&10 %
Socket Framing.....dis 60&10 %
Socket Corner.....dis 60&10
Tanged Firmers.....dis 40 %
Butcher's.....$5·50 to £ gold—new list
Newbould's.....$5·50 to £ gold
Spear & Jackson's.....$5·50 to £ gold—new list

Clips, Axle.
Norway or Best.....dis 20 @ 30 %
Superior.....dis 40&5 %
"Star," Superior, Philadelphia.....dis 45&5 %

Coal Shovels.
Iron Handled.....₩ doz, $ 85 @ 1 25
Wooden Handled.....₩ doz, 1 00 @ 2 00

Coal Hods.
Smith, Burns & Co.....dis 35 %

No.	14	15	16	17	18	
Japanned	$9·00	9·75	10·50	12·00	13·50	per doz
Galvanized	13·00	14·50	15·50	17·50	19·50	"

Cocks.
Brass Racking.....dis 10&10 %
Lock and Globe.....dis 10&10 %

Coffee Mills.
Board and Box.....dis 15 %
Increase Wilson's.....new list dis 10 %
Selsor's Pat.....$9·50, $10·50—dis 20 %
French Steel.....dis 10 @ 20 %
"Champion".....dis 20 %
Swift's.....dis 20 %

Compasses and Dividers.
Bemis.....dis 15&15 @ 20&5&15 %
Excelsior.....dis 30 %
Peck Stow & Wilcox.....dis 25 %

Coopers' Tools.
Bradley's.....dis 15 @ 20 %
Chas. E. Little.....dis 15 @ 30 %

Corn Knives and Cutters.
Bradley's.....list net

Crucibles.
Gautier & Co.....₩ No. 5½c

Curry Combs.
Hotchkiss' and Kellogg's, Iron and Brass.....dis 15 %
Fitch's.....dis 15&10 %
Ruggles'.....dis 15 @ 20 %
Rubber.....₩ doz, $9·00—dis 10 %
Schweitzer Mfg. Co.....dis 20 %

Curtain Pins.
Silvered Glass.....dis 40&10 %

Cutlery.
American Table.....
American Pocket.....dis 15 %

Door Springs.
Gray's.....$7·50 per doz—dis 40 %
Torrey's Patent.....$7·50 ₩ doz—dis 40 @ 40&10 %
Palmer's Japanned No. 6.....₩ doz net 6·00
" Coppered " .....6·00
" Silvered " .....8·00
Challenge.—
Japanned.....₩ doz $4 00 @ 6 00
Bronzed.....₩ doz 5 00 @ 7 00
Nickel Plated.....₩ doz 6 50 @ 9 00
1 Gross lots.....dis 10 %
5 Gross lots.....dis 20 %

Drawing Knives.
Bradley's.....dis 60 @ 60&10 %

Drills.
Ingersoll's Ratchet.....dis 25 %
Moore's Triple Acting Ratchet.....dis 30 %

Egg Beaters.
Monroe's.....₩ doz net $8·25 @ 8·50
Ashley's.....₩ doz net 2·25 @ 3·00
Earle's Patent.....₩ doz net 5·50 @ 6·00
Pratt's Aerating.....dis 10 %
Dover.....₩ doz net $6·00

Emery.
Genuine Chester—Regular Nos.....₩ lb 8c }
" Flour and FF.....₩ lb 5c } dis 5 @ 10 %
Washington Mills—Regular Nos.....₩ lb 8c
" Flour.....₩ lb 5c

Enameled and Tinned Ware.
Kettles.....dis 15 %
Sauce Pans, Glue Pots, &c.....dis 10 %

Faucets.
Cork Lined, Wood.....dis 60 %
Fenn's.....dis 50 %
" Cork Stops.....dis 40 %
Star.....dis 55&10 %
Frary's Patent Petroleum.....dis 10&10 %
Taylor's Pattern " .....dis 20&10 %
Wood and Metallic.....dis 40 %

Files.
Nicholson.....$5 00 to £ currency
Newbould's.....5 50 to £ gold
J. & Riley Carr's.....5 50 to £ gold
" " Rasps.....5 50 to £ gold
Stubs'.....5 75 to £ gold
Butcher's.....8 50 to £ gold
Spear & Jackson's.....5 50 to £ gold
Hargreaves, Smith & Co.'s.....5 00 to £ gold
Jowitt's.....5 25 to £ gold
" "Western".....5 00 to £ net
W. K. & C. Peace's "Imperial".....5 25 to £ gold
R. Ibbotson.....5 00 to £ gold
Beam & Murray, "Cyclops".....4 85 to £ gold
Fisher's.....4 75 to £ gold
Goodlad's.....4 00 to £ gold
Moss & Gamble.....5 25 @ 5 50 to £ gold

Fluting Machines.
Acme.....$7 00 each net
Cole.....5 75 each net
Manville, No. 2.....7 00 each net
Knox, with 4-inch Rolls.....5 00 each net
" " 6 " .....6 00 each net
O. K.....6 50 each net
Peerless, 4-inch Rolls.....4 00 each net
" " 5 " .....5 00 each net
Excelsior, No. 1.....4 75 each net
" No. 2.....6 50 each net
Diamond.....7 50 each net
Climax 7-inch Rolls.....8 00 each net
" 4½ " .....6 50 each net
Empire.....4 00 each net
Eureka, No. 1, 7-inch Roll.....8 00 each net
" No. 2, 5-inch Roll.....6 00 each net
K. F. M., 4-inch Roll.....5 50 each net
" 6-inch Roll.....6 00 each net
Fairy, Self-Heater.....10 00 each net
National, 5-inch Rolls.....5 00 each net
Ponton Fluter, Bright.....$1 50—dis 25 %
" " Galvanized.....2 00—dis 25 %
Geneva Hand Fluter.....$1 25 each net

Fry Pans.
Tinned.....dis 20 %

₩ doz.....	$3·00	3·25	3·62	4·00	4·50	5·00	5·50	6·00	7·50
No.	0	1	2	3	4	5	6	7	8

Peck, Stow & Wilcox.....dis 25 %
Smith, Burns & Co., "Excelsior" Polished.....dis 20 %

₩ doz.....	$3·70	4·00	4·70	5·20	6·00	7·00	8·00	9·00
No.	1	2	3		5	6	7	8

Hammers.
Emmet Hammer Co.....dis 10 %
Maydole's.....new list net
Cheney's.....new list net
Verree.....dis 5 %
Yerks & Plumb.....new advanced list dis 5 @ 10 %
Minot & Co.....dis 15 %

Handles.
Hammer and Hatchet.....dis 10 %
Quakertown, Axe, Pick and Sledge.....dis 10 %
" Hammer and Hatchet.....dis 10 %
Greensboro', Axe, Pick, Hammer, &c.....dis 10 %
Woolworth Axe, Pick and Sledge.....dis 10 %

Harness Snaps.
Judd's.....dis 30 %
Fitch's.....dis 30 %

Hatchets.
Isaiah Blood.....dis 10 %
Shingling, Nos. 1 2 3.....₩ doz $7 50 8 00 8 50
Claw, " 1 2 3.....₩ doz 8 50 9 00 9 50
Lathing, " 1 2 3.....₩ doz 7 50 8 00 8 50
Hunt's.....
Shingling, Nos. 1 2 3.....₩ doz $7 25 8 00 8 75
Claw, " 1 2 3.....₩ doz 7 75 8 50 9 25
Lathing, " 1 2 3.....₩ doz 7 50 8 25 9 00
Hurd's.....dis 20 %
Shingling, Nos. 1 2 3.....₩ doz $8 00 8 50 9 00
Claw, " 1 2 3.....₩ doz 9 00 9 50 10 00
Lathing, " 1 2 3.....₩ doz 8 00 8 50 9 00
J. P. Verree & Co.....dis 5 %
Shingling, Nos. 1 2 3.....₩ doz $7 00 7 50 8 00
Claw, " 1 2 3.....₩ doz 7 50 8 00 8 50
Lathing, " 1 2 3.....₩ doz 7 00 7 50 8 00

Hinges.
Wrought Strap and T.....dis 30&7½ %
Providence Plate..... { 6 and 8 in. list 11c. } dis 10&5 %
{ over 8 in. list 9½c. }
Screw Hook and Strap..... { 8, 10, 12 in. 8¾c } net
{ 14 to 36 in. 7¼c }

Hoes.
Solid Shank, C. S.....₩ doz $8 00—dis 20 @ 25 %
Socket.....₩ doz 9 00—dis 20 @ 25 %
Riveted Eye.....₩ doz 5 00—dis 20 @ 25 %
Grub.....dis 20 %
Planters'—Winsted.....add 10 %
Scovill.....add 35½ %
Scovill Pattern (Winsted).....add 20 %

Hooks.
Belt.....dis 30 %
Bench.....₩ doz net $5 00 @ 8 50
Wardrobe, Japanned.....new list dis 10&10 %
Hat and Coat " .....new list dis 15&10 %
Wrought Staples and Hooks and Staples.....dis 60 %
Wrought Hasps and Staples and Hasps, Hooks and Staples.....dis 60 %
Screw Hooks and Eyes, revised list.....dis 60&10 %

Horse Nails.
Putnam's.

No.	5	6	7	8	9	10
	31c	28c	26c	25c	24c	23c

In lots 2000 lbs. dis 5 %.

Ausable.

No.	5	6	7	8	9	10
	30c	27c	25c	24c	23c	22c

In lots of 1000 lbs. 5 % discount.

Brundage.

No.	5	6	7	8	9	10
	29c	26c	24c	23c	22c	21c

In lots of 500 lbs., dis. 5 %.

American Pressed.

No.	5	6	7	8	9	10
	22c	21c	20c	20c	20c	20c

In lots of 1000 lbs. dis 5 %.
Perkins Finished (ready to drive).

No.	5	6	7	8	9	10
	31c	28c	26c	25c	24c	23c

In lots of 1000 lbs. dis 5 %.
Buffalo Forged.

No.	6	7	8	9	10
	28c	26c	25c	24c	23c

Globe (Pointed and Polished).

No.	5	6	7	8	9	10
	31c	28c	26c	25c	24c	23c

In lots of 1000 lbs., 5 % discount.

National (Pointed and Polished), Extra Finish.

No.	5	6	7	8	9	10
	30c	27c	25c	24c	23c	22c

In lots of 1000 lbs., dis 5 %.
Vulcan (Blued, pointed, ready to drive).

No.	5	6	7	8	9	10
	33c	30c	28c	27c	26c	25c

In lots of 500 lbs., 5 % discount.
" 1000 lbs 7½ % discount.
New London Horse Nails.

No.	6	7	8	9	10
Great Western	27c	25c	24c	23c	22c
U. D.	29c	27c	26c	25c	24c

In lots of 1000 lbs., dis 5 %.
Star Brand.....₩ lb 16c
Morgan.....16c

Horse Shoes.
Burden.....₩ keg, $6 37½
Shoenberger.....₩ keg, 6 37½
R. I. Horse Shoe Co., Perkins Pattern.....₩ keg, 6 37½
" " R. I. Pattern.....₩ keg, 6 87½
Mule Shoes.....₩ keg, 7 37½

Kettles.
Enameled.....dis 15 %
Brass.....₩ lb 55c
In lots of 500 lbs.....₩ lb net 50c

Knives.
Ames' Butcher Knives.....dis 20 %
" Shoe " .....dis 15 %
Hay and Straw, "Wadsworth's".....dis 20 %

Knobs.
Base—Common.....net
" Plush Tip.....dis 10 %
" Elastic End.....reduced list dis 10&10 %
Trenton Lock Co.....dis 40 %

Lanterns.
Brady's Patent.....dis 10 %
Ætna.....dis 10 %
Yankee.....dis 10 %
De Beque.....dis 10 %

Locks and Latches.
Cabinet—Eagle.....dis 25 %
Cabinet—Gaylord.....dis 25 %
Trunk.....dis 10 %
Continental.....dis 15 %
Shepardson's.....dis 20 %
Trenton Lock Co.....dis 40 %
Branford.....dis 40 %
Norwich.....dis 40 %

Meat Cutters.
Dixon's (P. S. & W.).....dis 10 %

No.	1	2	3	4
₩ doz.	$14 00	$17 00	$19 00	$20 00

Hales'.....dis 25 %

No.	11	12	13
₩ doz	$27 00	$33 00	$42 00

Perry's Champion (P. S. & W.).....dis 10 %

No.	200	300	400
₩ doz.	$22 00	$21 00	$40 00

Woodruff's (P. S. & W.).....dis 10 %

No.	100	150
₩ doz.	$15 00	$18 00

American.....dis 25 @ 25&5 %

No.	1	2	2½	3	4	5
Each	$6 00	$9 00	$14 00	$15 00	$30 00	$75 00

Molasses Gates.
Stebbins' Pattern.....dis 60&10 %
Tinned ends.....dis 40&10 %
Weed's Patent Self-Boring.....dis 15 %
" without Auger Bit.....dis 10 @ 50 %
Patent Self-Measuring.....per doz $12 00—dis 20 %

Mouse Traps.
Wood Choker.....₩ doz holes, 16 @ 20c

Nails.
10d Cut (Standard).....$4 75

Nuts and Washers.
Nuts, large.....3½c off list
" small.....4½c off list
Washers (as to quality).....5c @ 6c off list

Oil Stones.
Washita No. 1.....₩ lb 22c
" Slips.....₩ lb 44c
Hindostan.....₩ lb 6c dis 10 %
" Slips.....₩ lb 10c dis 10 %

Oilers.
Olmsted's.....dis 25&10 %
Broughton's.....dis 25&5 %
Common Zinc, Brass and Copper.....dis 25 %

Picks.
Washoe R. R. Nos.

	1	2	3	4	5
₩ doz...	$14·00	15·00	16·00	17·00	18·00
" ...	8·50	9·00	10·00	11·00	13·00
Washoe Coal, "					15·00

Picture Nails and Knobs.
Richards' Patent.....dis 40 @ 40&10 %

Planes.—(See Trade Report.)
Plane Irons.....list net
" Butcher's.....$5 50 to £ gold—new list
" Spear & Jackson's.....5 50 to £ gold—new list
" Sandusky Tool Co.....list net

Pumps.
Douglas Cistern, etc.....new list dis 25 %
" S. & F.....new list dis 20 %

Rakes.
Cast Steel.....dis 25 %

$8 00	9 00	10 00	11 00
8	10	12	14 teeth.

Razor Straps.
Genuine Emerson (B. F. Badger).....dis 40&10 %
Grant's.....dis 25&10 %
Chapman.....dis 10 @ 15 %

Rivets.
Iron and Tinned.....dis 25 %
Copper Rivets and Burrs.....dis 10 %

Rods.
Stair.....new list dis 25 %
American Patent.....dis 25 %

Rope. Manufacturers' List.
Manila.....½ inch and larger ₩ lb 18c
" .....⅝ inch ₩ lb 18½c
" .....¼ and 5-16 inch ₩ lb 19c
" Lath Yarn.....₩ lb 12c
" Hay Rope.....₩ lb 19½c
Jute.....₩ lb 13c
Sisal.....½ inch and larger ₩ lb 15½c
" .....⅜ inch ₩ lb 16c
" .....¼ and 5-16 inch ₩ lb 16½c
" Hay Rope.....₩ lb 16c

Rules.
Hubbard & Curtiss Mfg. Co.....new list net
Stanley Rule and Level Co.'s Ivory.....dis 50&10 %
" " " Boxwood.....dis 6 @ 10 %
Standard Rule Co.'s Boxwood.....dis 60&10 %

Sad Irons.
Sand Paper—dis 7½ @ 10 %
Beader & Adamson's (Flint) 00 to 1½.....$4 50 ₩ ream
" " " 2, 2½ & 3.....5 00 "
Assorted.....4 50 "
Star.....₩ ream $3 50
Emery.....₩ ream $7 00 @ 12 00
Cowdin Mfg. Co.....dis 7½ @ 10 %
Diamond Flint, 00 to 1½.....per ream $4 50
" 2, 2½, 3 and assorted.....5 00
" Emery Paper.....per ream $7 00 to 12 00

Sash Locks.
Clark's.....dis 20 %
Ferguson's.....dis 20 @ 25 %
Champion.....₩ gross $13 00 @ $15 00
Norwich.....dis 15 %

Sash Weights.
Solid Eyes.....₩ lb 2¾c

Sausage Fillers.
Perry's (P. S. & W.).....dis 10 %

No.	1	0
₩ doz.	$15 00	$21 00

Saw Rods.
.....dis 10 %

Saws.
Spear & Jackson's.....$4 50 to £ gold
John Spear.....$3 00 to £ gold
Ann. Saw Co.....new list
Perforated Cross Cuts, all kinds.....68c ₩ foot
Inserted Tooth.....dis 10 %
All else.....dis 12½ %
Disston's.....dis 11½ %
H. W. Peace's Circulars.....dis 10 %
Other kinds.....dis 10 %
Wm. McNiece's Hand, Cross Cut and Circular.....new list dis 10 %
Lightning.....new list dis 30 %

Scales.
Brown's.....dis 25&5 %
Fairbanks'.....new list dis 15 @ 20 %
Howe's.....dis 15&5 %
Shattuck's Counter and Union.....dis 15 %
National Platform.....dis 25 %
Eureka.....dis 25 %
Scale Beams.....dis 20 %
No. 1 300 to 1200 lbs.....90c ₩ cwt
No. 2 " .....75c ₩ cwt

Screws.
American list of April 1, 1873.
Flat Head Iron.....dis 47½ %
Round Head Iron.....dis 45 %
Flat Head Brass.....dis 60 %
Round Head Brass.....dis 50 %
Round Head Silver Capped.....new list dis 20 %
Hand Rail.....dis 30 %
Coach or Lag.....dis 25 %
Coach, Patent Gimlet Point.....dis 15 %
Bed.....list net

Scythes.
Blood's German Steel, Grass.....₩ doz $9 00
" Cast " " .....₩ doz 10 00
" Silver " " .....₩ doz 11 00
" German " Grain.....₩ doz 13 00
" Cast " " .....₩ doz 14 00
" Red Rover.....12 00
" Young America.....9 50
" Silver Clipper.....12 63
Scythe Snaths.....dis 20 %

Shears.
Cast Steel.....dis 60&10 %
Conn. Cutlery Co., new brand.....dis 60 %
Rowe's.....dis 50&10 %

Shovels and Spades.
Ames.....list July 1, '70, list net @ dis 2½ %
Rowland.....new list Feb. 8, '73, dis 20 %
Old Colony.....dis 2½ %

Shovels and Tongs.
Iron Head.....list net
Brass Head.....dis 5 %
Polished Steel.....new list dis 15 %

Slates.
Square Frames, Round Cornered, by case.....dis 60&10 %
Less than a case.....dis 50 @ 55 %
Oval Frames, by case.....dis 40 @ 40&10 %
Less than a case.....dis 30 %

Spoons.
Iron.....new advanced list, dis 10 %
By the case.....dis 20 %
Britannia.....dis 40 %
Plated A 1.....dis 20&5 @ 25&5 %
German Silver.....add 10 @ dis 5 %
Tinned (P. S. & W.)—
Teas.....$1·50 ₩ gross, net
Tables.....2·75 " net

Stocks and Dies.
.....dis 15 %

Stove Polish.
Joseph Dixon's.....₩ gross, $6 00 @ 6 25
National.....₩ gross $4 75
Gold Medal.....₩ gross $6 00, dis 15 %
Gem.....₩ gross $5 00, dis 10 %

Squares.
Steel.....dis 50 %; full cases, dis 50&10 %
Iron.....dis 50 %; full cases, dis 50&10 %
Nickel Plated.....add $2 50 @ $4 00 ₩ doz net
Try Squares and T Bevels.....dis 45&10 %
Star Try Squares and Bevels.....dis 50 %

Tacks.
Full Weight American Iron.....dis 35&7½ %
Half Weight American Iron.....dis 67½&7½ %
Carpet.....dis 7½ %
Brads American Half Weight.....dis 50&7½ %
Finishing Nails.....

₩ lb.	25c	20c	18c	14c	13c
½	⅝	¾	1	1¼ in. and over	

dis 7½ %

Trunk and Clout.....

₩ lb.	25c	20c	18c	14c	13c
½	⅝	¾	1	1¼ in. and over	

dis 7½ %

Copper Tacks.....₩ lb 56c—dis 7½ %
Iron Shoe Nails, ₩ lb 4-8 and longer, 10½c; 3-8, 11c.....dis 7½ %
Double Pointed.....new list dis 33⅓ %

Tapes, Measuring.
American Flask and Cap Co.....dis 10&10 %
Eddy's.....dis 10&10 %

Toe Calks.
.....₩ lb 13c net

Tobacco Cutters.
Champion.....dis 20 %
Peck, Stow & Wilcox.....dis 10 %

Tinners' Tools and Machines.
P. S. & W.....list net

Traps.
Newhouse.....dis 20 %
Hotchkiss.....dis 20 %
Peck, Stow & Wilcox.....dis 30 %
Blake's Patent.....dis 15 @ 20 %

Vises.
Trenton Vises, Solid Box.
30 to 110 lbs.....17c
111 to 160 lbs.....18c
160 and over.....21½c
Peter Wright's.....₩ lb 15½c, gold
Wilson's Solid Box.....dis 10 @ 15 %
30 to 160 lbs.....18c
160 and upward.....21c
Backus & Union, Parallel.....dis 25 %
Buffalo, Parallel.....new list dis 15 %
Fisher & Norris' Double Screw Parallel.....dis 15 @ 15&5 %

Wire.
Bright and Annealed.....Nos 0 @ 18 dis 30 @ 32½ %
" " " .....19 @ 26 dis 40 @ 42½ %
" " " .....27 @ 36 dis 45 @ 47½ %
Coppered.....Nos. 0 @ 18 dis 20 @ 25 %
Galvanized, Nos. 6 to 12.....dis 35 @ 40 %
Galvanized, Nos. 13 to 18.....dis 40 @ 45
Tinned.....dis 15 @ 20 %
Cast Steel.....5 @ 10 %
Tinned Broom Wire.....dis 20 @ 25 %
Galvanized Telegraph, Nos. 8 and 9.....₩ lb 10c @ 11c
" " " 10 and 11.....₩ lb 11c @ 12c
" " " 12.....₩ lb 11½c @ 12½c
Annealed Fence, Nos. 8 and 9.....dis 30 @ 32½ %
" Grape, " 10 to 14.....dis 30 @ 32½ %
Fence Staples.....₩ lb 9¼ @ 10c
Stubs' Steel Wire.....$7 00 to ₩ gold

Wrenches.
American Adjustable.....dis 45 %
Baxter's Adjustable "S".....dis 20 %
" Diagonal.....dis 20 %
Collin's & Co.'s.....new dis list 30 %
Coes' Genuine.....dis 30&10 %
" Pattern (Wrought).....dis 50 %
" " (Malleable).....dis 50&10 %
Lindsay's Patent.....dis 25 %
Taft's Pattern.....dis 65&10 %
Davis' Patent Duplex.....dis 40 %

METALS.

IRON.—DUTY: Bars, 1 to 1½ cents per lb., Sheet, Band, Hoop and Scroll, 1¾ to 1¾ cents per lb. Provided, that none of the above Iron shall pay a less rate of duty than 35 per cent. Pig, $7 per ton; Polished Sheets, 3 cents per lb.; Wrought Scrap, $8 per ton; Cast Scrap, $6 per ton. All subject to a reduction of 10 per cent. Railroad, 20 cents per 100 lbs. Boiler and Plate, 1½ cents per lb.

Pig Iron—AMERICAN.

Foundry No. 1	₩ ton,	$44 00 @ 47 00
Foundry No. 2	"	35 00 @ 40 00
Gray Forge	"	30 00 @ 36 00
White and Mottled	"	28 00 @ 29 00
SCOTCH.		
Gartsherrie	"	@ 48 00
Coltness	"	@ 51 00
Glengarnock	"	46 00 @ 47 00
Eglinton	"	

Bar Iron.
Am. Rehned, at mill.....₩ lb 3·7 @

Rails.
Welsh, gold.....₩ ton, 65 00 @ 68 00
American, at works, currency....." 75 00 @ 77 00
Old Rails, currency....." 45 00 @ 46 00

Scrap.
Wrought Scrap, from yard, nominally....." 44 00 @ 45 00

Bar Iron from Store.
Common Iron.
¾ to 2 in. round and square.....₩ ton, $ 77 50
¾x9-16 in " " ....." 82 50
1 in. " " ....." 85 00
2½ & 3 in. " ....." 82 50
1 to 6 in. wide x ⅜ and 1 in. thick....." 77 50
1¼ to 6 in wide x ¾ & 5-16 in. thick....." 82 50
1 and 1¼ in. x ¼ and 5-16....." 90 00
Swedish Iron.
1¼x⅜ and ½....." 185 00
1¾x⅜ to ⅝, and ⅝ square....." 180 00
1¾ to 5x⅜ to ⅝ and ⅜ to 2-in. square....." 175 00
to 12x⅜ and ½....."
Refined Iron.
¾ to 2 in. round and square....." 82 50
1 to 6 in. wide x ⅜ to 1 thick....." 82 50
1¼ to 6 in. wide x ¼ and 5-16 thick....." 87 50
1 and 1¼ x ¼ and 5-16....." 92 50
Large Rounds.
2⅜ to 2¾, round and square....." 92 50
3, 3¼ and 3½ in....." 97 50
3¾ and 4 in....." 107 50
Rods—⅝ and 11-16, round and square....." 87 50
½ and 9-16, " " ....." 93 50
7-16, " " ....." 98 00
⅜, " " ....." 103 00
5-16, " " ....." 108 00
¼, " " ....." 110 00
9-16, " " ....." 135 00
Band Iron.
1 to 6 in. x 3-16 to No. 12....." 100 00
Horse Shoe Iron.
⅝ and ⅛ x ⅜, to ½....." { 117 50
1 x ⅜, to ¾ " ....." }
Ovals, Half Ovals and Half Rounds.
⅜ to 1½.....₩ ton, $107 50
⅝ and 11-16....." 112 50
⅝ and 9-16....." 117 50
½.....
⅜.....
Nail Rods
Best Norway.....₩ lb 9c
Norway Shapes
½ to 2 in. x ⅛ to ⅜....." { 8½c
⅛ to ¾ square....." }
Norway Bar
⅝ to 2 in. square.....
Spring Steel
1 to 4 in. wide....." 8½c
Tire Steel
⅝ to 1½ x ¼ and 5-16....." 9c
⅜ & 1 x 3-16....." { 10c
⅝ & 1 x ⅛....." }
Toe Calk Steel
½ to ⅝ x ⅜ to ½....." 8½c
Plow Steel
⅜ to 1½

CHARCOAL TIN PLATE.

I C 10x14,	Prime Charcoal	$8·25
12x12,	"	13·75
14x20,	"	14·00
I X 10x14,	"	15·50
12x12,	"	16·00
14x20,	"	16·50

For each additional X add..... 2·25

COKE TIN PLATE.

	Best.	2d Quality.	Ordinary
I C 10x14.....	$12·75	$11·75	9·50 @ $11·00
I C 12x12.....	13·00	12·00	
I C 14x20.....	13·50	12·75	

TERNE PLATE.

	Prime Char.	2d qual.	Coke.
I C 14x20....	$12·00	11·25 @ 11·50	9·25 @ 11·25
I X 14x20....	14·00		

ZINC.—DUTY: Pig or Block, $1 50 per 100 lbs. Sheet, 2½c. ₱ lb. All subject to a reduction of 10 per cent.

Sheet..... cask 10½c

" ..... open 11c

Paper Stock, Old Metals, &c.

(Dealers' Selling Prices.)

Canvas linen	6 @ 6¼
" cotton, No. 1	7¼ @ 7½
" " No. 2	4
White linen rags, No. 1	7 @ 7¾
" " No. 2	4¾ @ 5
Colored	3 @ 3½
Mixed woolens	2 @ 3
Soft woolens	7 @ 7½
Gunny bagging	1½ @ 1¾
Jute Butts	1¾ @ 1¾
Kentucky bagging	3½ @ 3¾
Book stock	4½ @ 4¾
Waste paper and scraps	2½ @ 3
Rope cuttings	1½ @ 3
Kentucky Bale rope	4 @ 4¼
Oakum junk, No. 1	5¼ @ 5½
" No. 2	4½ @ 4¾
Grass rope	4¾ @ 4¾
Tarred Shaking	1¾ @ 2

Old Metal.

Copper	26 @ 27
Yellow metal	18 @
Brass	18 @ 20
Heavy Composition	21 @ 23
Old lead, solid	6½ @ 7
Tea lead	6
Wrought Iron	1¾ @ 2
Sheet iron	1 @
Cast Iron	1 @ 1¼
Machinery Iron	1¾ @ 2
Zinc	6
Pewter, No. 1	26 @ 27
" No. 2	10 @ 12
Spelter	7

Paints, Oils, etc.

Paints.

Black, lamp—Coach Painters	₱ lb 20c
" " Ordinary	8c
" Ivory Drop, fair	15c
" " best	26c
Black Paint, in oil kegs, 8c.; asst'd cans, 11 c	
Blue, Prussian, fair to best	50 @ 75c
" " " in oil	35 @ 45c
" Chinese, dry	83c
" Ultamarine	25 @ 30c
Brown, Spanish	1½c
" Van Dyke	3c
Carmine, 40	$12 00
Green, Chrome	15 @ 23c
" " in oil	18 @ 25c
" Paris good, 30c; best, 40c	
" " in oil " 30c; " 45c	
Mineral Paints	1¼ @ 4c
Orange Mineral	14½c
Red Lead, American	9½c
" " English	10½c
" Venetian (N. C.) dry	2¾c
" " in oil asst'd cans, 11c; kegs, 8½c	
" Indian, dry	10c
Rose Pink	13c
Sienna, American, Raw	4c
" Burnt	4½c
" " in oil	16 @ 20c
" Raw "	15 @ 25c
Umber, Burnt	4 @ 8c
" " in oil	16 @ 21c
" Raw	3½ @ 7½c
" " in oil	16 @ 22c
Vermillion, Chinese	$1 45
" English	1 45
" Trieste	1 18
" American, Common	23c
White Lead, American, pure dry	11½c
" " " in oil	12 c
White, Paris, English, prime in bbls.	2½ @ 2¾c
Yellow Ochre French	2½ @ 2¾c
" in oil asst'd cans, 11c; kegs, 8½c	
" Vermont in casks	1½c
Chrome	17 @ 21c
" in oil	18 @ 23c
Zinc White, American No. 1 dry	9c
" " 1, in oil	11c
" French (Paris)	11 c
" " in oil	12 c

Oils.

Linseed Raw ₱ gal. casks, 96c; bbls, 97c	
" Boiled " $1·01 " $1·02	
Whale, Crude	"
" Bleached Winter	"
Sperm, Crude	"
" Winter unbleached	"
" " Bleached	" 1·80
Seal, Extra Refined	" 87½c
Lard, Pure Winter	" 80c
" Spring	" 72c
Cotton Seed, Crude	" 55c
" Southern Yellow	" 65c
" White	" 75c
Neatsfoot, Winter	$1·10 @ $1 25
Natural Lubricating	bbls, 45c

Sundries.

Asphaltum	9c
Benzine	₱ gal. 16c
Chalk	1½c
" Block	
Dryer, Patent, Am'n asst't cans, 10 @c.; kegs, 9c	
" " English " 11c.; " 9c	
Flocks	
Frostings	50c
Glue, White	33 @ 47c
" Sheet	30c
Glaziers' Points, Zinc	9c
Gum, Copal	35c
" Damar	25c
" Shellac, English	66c
" " dark	46c
Litnarge	10c
Pumice Stone, selected Lumps	4 @ 5c
" powdered	4c
Putty in bladders	3½c
" in bulk	3c
Rotton Stone, soft, English	8c
Spirits Turpentine	4
Whiting, Spanish	1¾c

Glass.

French Window—1st, 2d, 3d, and 4th qualities. Per box of 50 feet.

SINGLE.

SIZES.	I.	II.	III.	IV.
6 x 8 to 10 x 15	$10·75	$9·75	$9·00	$8·25
11 x 14 & 12 x 13	11·50	10·25	9·75	8·75
10 x 16 to 14 x 36	12·50	11·50	10·25	9·00
18 x 22	13·25	12·00	10·75	9·50
15 x 26 to 20 x 30	15·75	14·00	12·00	10·25
22 x 30 to 24 x 30	19·75	16·75	13·50	
26 x 28 to 24 x 36	20·25	17·50	14·00	
26 x 36 to 26 x 44	22·75	20·25	15·50	
28 x 44 to 30 x 50	24·00	21·50	16·75	
30 x 52 to 30 x 54	27·25	24·00	18·75	
30 x 56 to 34 x 56	29·50	26·25	22·00	
34 x 58 to 34 x 60	31·50	29·50	25·00	
36 x 60 to 40 x 60	37·00	32·50	29·50	

DOUBLE.

SIZES.	I.	II.	III.	IV.
6 x 8 to 10 x 15	$16·00	$14·00	$13·50	$12·50
11 x 14 & 12 x 13	17·25	15·50	14·75	13·25
10 x 16 to 14 x 36	18·75	17·25	15·50	13·50
18 x 22	20·00	18·00	16·25	14·25
15 x 26 to 20 x 30	24·00	21·00	18·00	15·50
22 x 30 to 24 x 30	30·00	25·25	20·25	
26 x 28 to 24 x 36	31·00	26·50	21·00	
26 x 36 to 26 x 44	34·00	30·50	23·25	
28 x 44 to 30 x 50	36·00	32·25	25·25	
30 x 52 to 30 x 54	41·00	36·00	28·25	
30 x 56 to 34 x 56	45·00	39·50	33·00	
34 x 58 to 34 x 60	48·00	43·00	37·50	
36 x 60 to 40 x 60	55·00	49·00	45·00	

Sizes above—$12 ₱ box extra for every five inches. Discount to the trade 60 %; 60&10 % for large lots.

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FRENCH PICTURE

And Car Glass, etc.

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WHEELER, MADDEN & CLEMSON.
WHEELER, CLEMSON & CO., FILES.
AMOSKEAG AXE CO.
TUTTLE MANUFACTUING CO.
EMPIRE MILLS TWINES.
FRENCH, SWIFT & CO.'S AUGERS & BITTS.
AUBURN TOOL CO.'S PLANES.
WINSTED HOE CO.'S PLANTERS HOES AND TOE CALKS.
WITHERBY TOOL CO.'S CHISELS, DRAWING KNIVES AND BORING MACHINES.
OHIO BUTT CO.
STEPHENS & CO.'S RULES.
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MANUFACTURERS OF

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Drilled and Wire Jointed, Fast and Loose, Loose Pin Reversible, Plain, Japanned, and Japanned with Silver Acorns. Loose Joint Japanned, and the same with Japanned or Silver Acorns.

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Our only Agent in NEW YORK, BOSTON, PHILADELPHIA and BALTIMORE. for the sale of our goods, and he is authorized to sell at our lowest factory rates.

Ohio Butt Co.

L. COES & CO.,

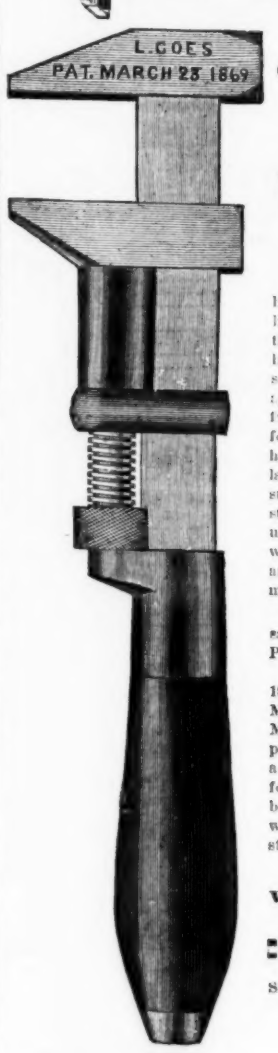
Manufacturers of

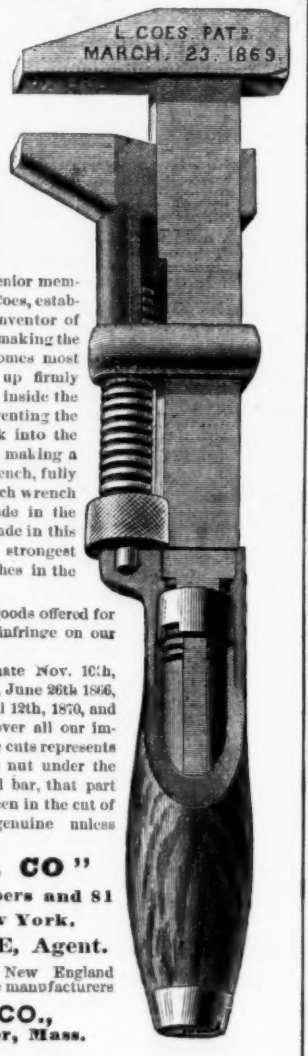
L. COES' Genuine Improved

PATENT

SCREW WRENCHES,

Worcester, Mass.





Our Mr. L. Coes, formerly senior member of the firm of L. & A. G. Coes, established in 1839, is the Original Inventor of the Screw Wrench, and has, by making the bar *wider*, where the strain comes most severe, and screwing a nut up firmly against four *square* shoulders inside the ferrule, thereby *effectually* preventing the ferrule from being thrust back into the handle or getting loose, and making a larger screw than in the old wrench, fully succeeded in making a 12 inch wrench stronger than a 15 inch made in the usual manner. All sizes are made in this way, and are undoubtedly the strongest and best finished Screw Wrenches in the market.

There are *Imitations* of our goods offered for sale, that, without question, infringe on our Patents.

We hold Patents bearing date Nov. 10th, 1863 (re-issued June 1st, 1869), June 26th 1866, March 22d, 1869 (re-issued April 12th, 1870, and May 14th, 1872), which fully cover all our improvements. One of the above cuts represents a sectional view, showing the nut under the ferrule, and the strengthened bar, that part being covered by the jaw, as seen in the cut of wrench complete. None genuine unless stamped

"L. COES & CO"

Warehouse, 97 Chambers and 81 Reade Streets, New York.

HORACE DURRIE, Agent.

Parties ordering from the New England States can order direct from the manufacturers

L. COES & CO.,
Worcester, Mass.

This cut shows the Snap pressed partly open.

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MIDDLETOWN, CONN.,

MANUFACTURERS OF

The Celebrated "Baldwin" Plane Iron,

HENSHAW'S PATENT HARNESS SNAPS

GERMAN HARNESS SNAPS,

PAT. GAFF TOP-SAIL SELF-MOUSING SHIP HOOKS

Plow, Fillettster & Dado Stops of all kinds, Set Screws for Plows, Bench Plane Starts, &c. Patent Washer Cutters. Plan Iron Screws to order of any size.

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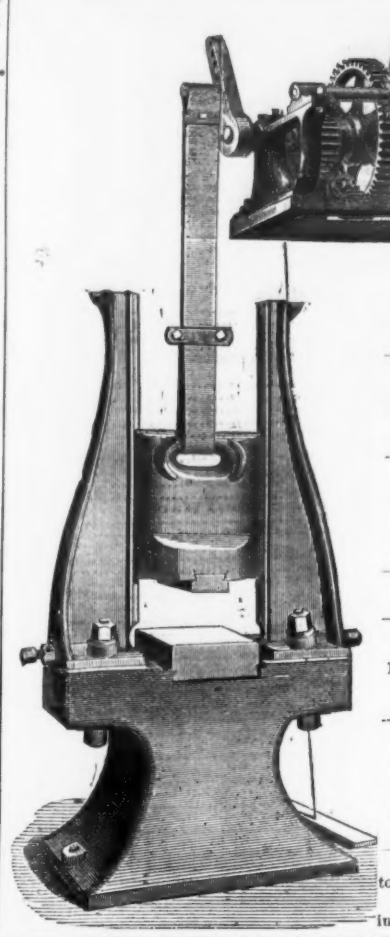


Peck's Patent

Drop Press

MILO PECK & CO.

SOLE MANUFACTURERS.

NEW HAVEN, CONN

PRICE LIST.

FOR FORGING.

No.	Weight of Hammer.	Distance between Uprights.	Lift of Hammer.	Price Complete.
2	100 lbs.	8 in.	24 in.	$ 330 00
3	150 "	10 "	30 "	467 00
4	250 "	12 "	30 "	750 00
5	400 "	16 "	30 "	900 00
6	650 "	16 "	30 "	1200 00
7	1000 "	16 "	30 "	1800 00
8	1500 "	16 "	30 "	2500 00

FOR STAMPING SHEET METALS.

No.	Size of Die Bed.	Weight of Hammer.	Price of Drop without Lifter.	Price of Lifter.
1	6 in.	50 lbs.	$ 137 50	$ 82 50
2	8 "	100 "	212 50	137 50
3	10 "	150 "	300 00	220 00
4	12 "	250 "	400 00	340 00
5	16 "	400 "	550 00	430 00
6	20 "	650 "	750 00	590 00
7	24 "	1000 "	1280 00	620 00
8	36 "	1500 "	1850 00	850 00

All sizes larger than No. 3 have Wrought Iron Cranks to the Lifter.

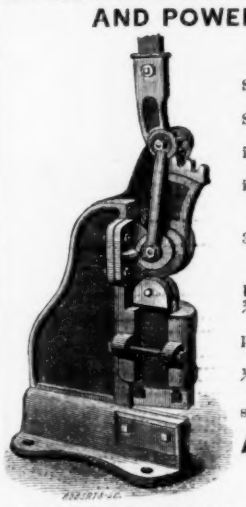
Our Patent Drop Lifter can be applied to any Drop in use.

Biddle Manufacturing Co.,

102 Chambers Street, N. Y., Manufacturers of

Hardware Specialties, Fine Tools,

IMPROVED HAND AND POWER DRILL PRESSES, AND HAND AND POWER SHEARS AND PUNCH PRESSES.



Patent Self Feed Hand Drill.....Price, $60·00
Patent Self Feed Single Speed Power Drill, Counter Shaft and Pulleys complete.....Price, 85·00
Patent Self Feed Three Speed Power Drill, Counter Shaft and Pulleys complete.....Price, 150·00
Round Bar Hand Shear, cuts round iron, ⅛ to 1⅛ inch.....Price, $ 6 to $100
Square Bar Hand Shear, cuts square iron, ¼ to 1 inch.....Price, 20 to 100
Flat Bar Hand Shear, cuts ⅜x1-16 to 2x⅜.....Price, 7 to 45
Plate Iron Hand Shear, cuts boiler plate any width, 3-16 to ⅜.....Price, 42 to 120
Hand Punch Press, punches ⅜x⅜ to ⅝x⅝.....Price, 25 to 200
Combined Hand Punch and Round and Flat Bar Shear, punches 1-16x1-16 to ⅜x⅜, cuts round iron ⅛ to ¾, cuts flat bar 2x⅜ and under.....Price, 15 to 160
Hand or Power Plate Iron Shear, cuts ⅜ boiler plate any width.....Price, 175 to 220
Hand or Power Punch Press, punches ⅝x⅝ to ⅝x⅝.....Price, 220 to 330
Power Round Bar Shear, cuts 1¼ and smaller sizes.....Price, 175 to 275

All kinds of Die Forgings promptly attended to.

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Send for Price List and Illustrated Catalogue.

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Hydraulic Jacks and Punches,

ROLLER TUBE EXPANDERS

And Direct-Acting Steam Hammers.

Communications by letter will receive prompt attention.

JACKS for Pressing on Car Wheels or CRANK PINS made to order.

IMPROVED BOLT MACHINERY.

BOLT HEADER,

That will head 10,000 per day.

Single & Double Head BOLT CUTTERS,

That will cut from 5000 to 10,000 per day.

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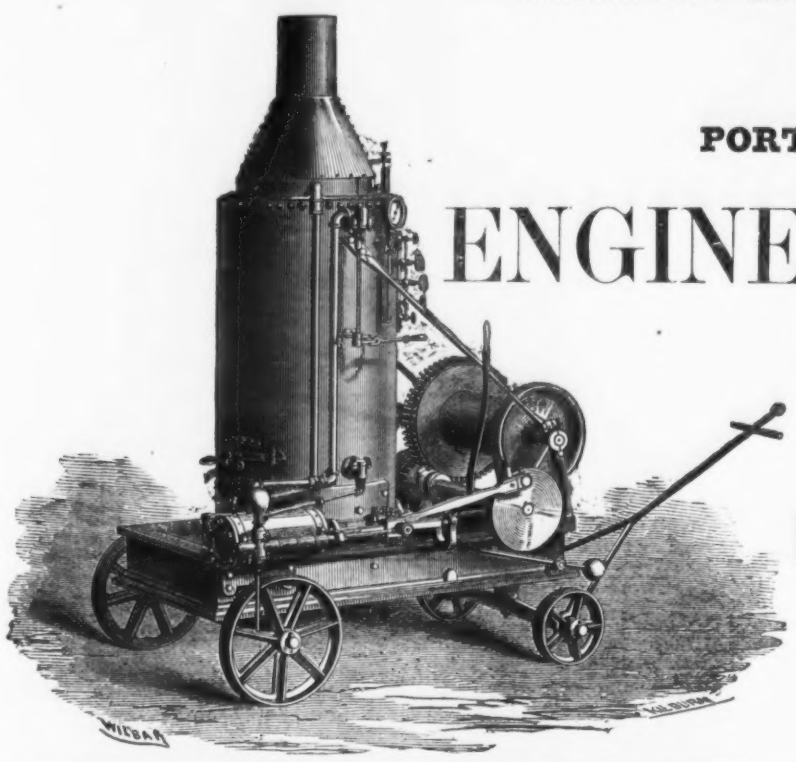

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WATER WHEELS,

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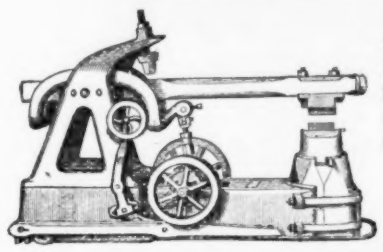

This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all the working parts from that jar and concussion which is the destroying element of other Helve Hammers. It is made Adjustable in Line of Action, Length of Stroke, Rapidity of Motion, and Weight of Blow, all of which are controlled at the will of the operator. They have *Larger Capacity, Cost Less,* are more *Durable,* take up *Less Room,* do *More* and *Better Work* at *Less Expense* for Power, than any other Hammer in use. We guarantee them fully as recommended. For particular address

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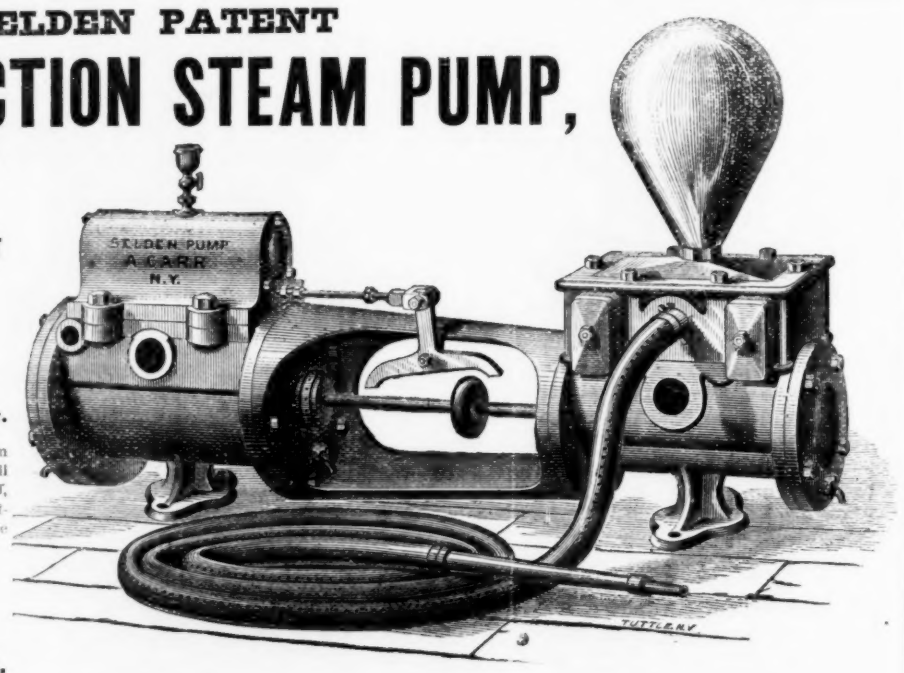
DIRECT ACTION STEAM PUMP,

Patented August 2nd and December 20th, 1870.

Tank Pump, with Boiler Feed Attachment.

For Boiler Feeders,
For Water Works,
For Fire Pumps,
For Mines, etc , etc.



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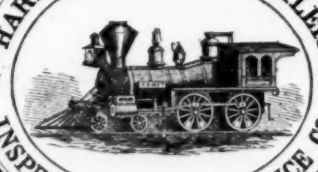

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Boilers, Buildings and Machinery,

ARISING FROM

STEAM BOILER EXPLOSIONS.

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New Style Testing Machines, all sizes, Wrought Iron Lever R. R. Track Scales, Parallel Crane Beams and Mortising Machines.

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JEWETT & SONS' PERFECTLY PURE WHITE LEAD.

TRADE MARK.

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ATLANTIC WHITE LEAD CO. ROBERT COLGATE & WARRANTED PURE

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The Atlantic White Lead and Linseed Oil Company,

MANUFACTURERS OF

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S. G. CORNELL & SON WARRANTED PERFECTLY PURE WHITE LEAD BUFFALO, N.Y.

TRADE MARK.

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WHITE LEAD Dry and in Oil,

Lead Pipe, Sheet and Bar Lead.

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THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

Union White Lead Mfg. Company

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B. W. How, Secretary. James How, President

MANUFACTURERS OF

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White Lead, &c.

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JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

TRADE MARK.

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Brooklyn White Lead Co.

BROOKLYN WHITE LEAD CO.-INCORPORATED 1825
SUPERIOR-PURITY, DURABILITY AND COLOR.
ADDITIONAL TRADE MARK.
We caution consumers against the numerous spurious brands, in imitation of ours, of adulterated and greatly inferior qualities—which are sold as our LEAD.
$50 Reward for detection of counterfeits.
F. HOWE, Tr.
Office, No. 89 Maiden Lane, NEW YORK.
BROOKLYN WHITE LEAD PREMIUM LEAD WARRANTED PURE

TRADE MARK.

White Lead, Red Lead and Litharge.

89 Maiden Lane, NEW YORK.

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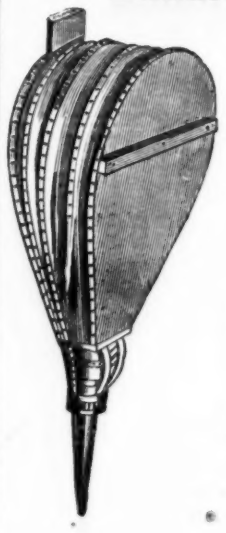
NEWCOMB BRO'S SONS,

Manufacturers of

Smiths', Moulders' and Hand

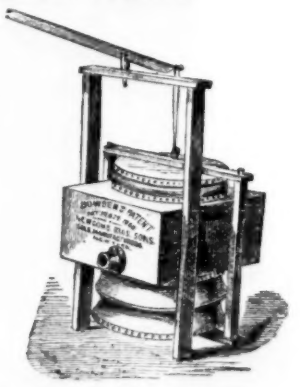


Also the Sole Manufacturers of

Bowden's Patent

TRIPLE-ACTION

Bellows.

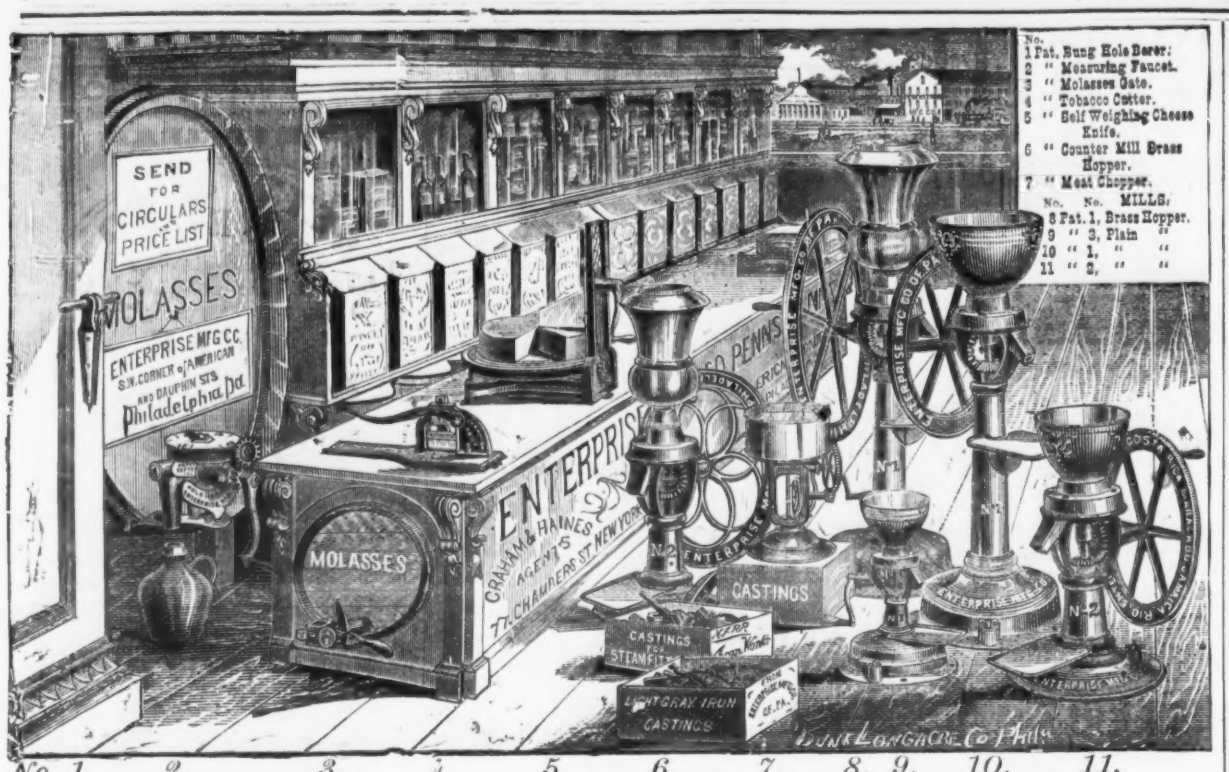


These Bellows are superior to all others now in use.

For further particulars send for descriptive circular and price list.

586 Water St., near Montgomery, N. Y.

Canal Street, East Broadway and South Street Cars cross Montgomery St


No.
1 Pat. Bung Hole Borer.
2 " Measuring Faucet.
3 " Molasses Gate.
4 " Tobacco Cutter.
5 " Self Weighing Cheese Knife.
6 " Counter Mill Brass Hopper.
7 " Meat Chopper.
No. No. MILLS.
8 Pat. 1, Brass Hopper.
9 " 3, Plain "
10 " 1, " "
11 " 2, " "
SEND FOR CIRCULARS & PRICE LIST
MOLASSES
ENTERPRISE MFG CO.
S.W. CORNER of AMERICAN AND DAUPHIN STS.
Philadelphia, Pa.
MOLASSES
ENTERPRISE
GRAHAM & HAINES AGENTS
74 CHAMBERS ST NEW YORK
CASTINGS
CASTINGS FOR STEAM FITTERS
LIGHT GRAY IRON CASTINGS
No. 1, 2, 3, 4, 5, 6. 7, 8, 9, 10, 11.

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ENTERPRISE MFG. CO., of Pa., or **GRAHAM & HAINES, Agents,**
HARDWARE MANUFACTURERS, 88 Chambers St., New York.
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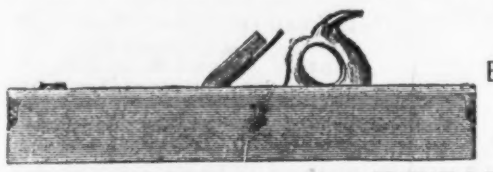
SANDUSKY TOOL CO.,

MANUFACTURERS OF

Planes, Plane Irons, Carpenters', Cabinet Makers' and Coopers' Tools,



Bench, Hand and Tail Screws, and Chisel, File and Auger Handles.

SANDUSKY TOOL CO., Sandusky, Ohio, or GRAHAM & HAINES, 88 Chambers Street, N. Y.

Railway, Blacksmiths' and Miners' Tools,

Railroad and Coal Picks, Crow Bars, Mauls, Tamping Bars and Picks, Rail Tongs, Sledge, Hand, Stone and Striking Hammers, Smiths' Tongs, Gas Pipe Tongs, Telegraph Pole Bars, Cold Chisels, Wedges, Frocs, Cast Steel Drills.

Self-colored Picks.....$8·00 per dozen.
Ground and Polished..... 9·60 "

Send for Catalogue.

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Manufacturers' Agent,
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CINCINNATI INDUSTRIAL EXPOSITION.

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Exhibiting space nearly Eight Acres! One Acre of Machinery in Motion!

OPEN SEPT. 3d TO OCT. 4th; GOODS RECEIVED UNTIL SEPT. 30th.

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G. E. R. S. — 1 8 1 0

Ent'd according to Act of Congress in the year 1866, by Benj. F. Badger, in the Cl'k's Office of the Dis. Court of Mass.

Headquarters for Henry Disston & Sons' Saws,

Hand, Mill, Circular and Cross Cut.

ALSO,

Plumbs and Levels, Try Squares, Gauges, Trowels and Barker's Reversible Butt.

A full assortment constantly on hand. Address orders to

GRAHAM & HAINES, 88 Chambers Street, N. Y.

VIENNA PREMIUMS.

THE WILSON SHUTTLE

SEWING MACHINES

Received the Grand

PRIZE MEDAL

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FOR THE

Best Sewing Machine

The Best made Sewing Machines,

And Three

Co-Operative Medals

FOR

The Best Made Set of Harness,
The Best Made Side Saddle,
The Best Boot and Shoe Work,
And the Best Samples of Cloth Sewing.

No other Sewing Machines received Premiums on their merits, which we will prove by evidence at our office, and that all reports relating to the contrary are false.

AGENTS WANTED,

WILSON SEWING MACHINE CO.,
707 Broadway, New York,
And all other cities in the United States.

BUILDERS' HARDWARE,

Pure Bronzed Metal and Hand-Plated Knobs, Hinges, &c.,

Agents for Goutter's Black Lead Crucibles.

Agency and Depot of the TRENTON LOCK COMPANY.

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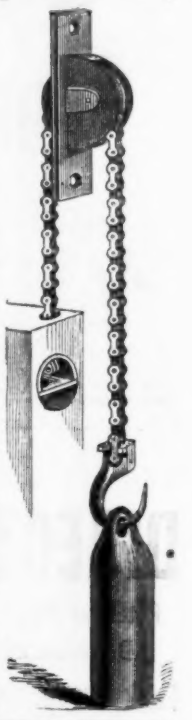
Manufacturers of every description of

Chain and Pulley for Heavy Sash

THOMAS MORTON,

Manufacturer of

Brass & Copper Chain,



And patented attachments for same, for suspending windows, from 100 to 1500 lbs. Sashes can be suspended with my Chain and attachments in a shorter time and with less trouble than by using the ordinary common cord. I am now offering the Chain and fastenings cheaper than any other in the market. Also manufacturer of the MORTON & BREMNER'S Straight and Circular Spring Balances. Established in 1842.

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A full assortment of

TACKS (all kinds), BRADS, TRUNK, CLOUT, HUNGARIAN and FINISHING NAILS.

Also, BLACK and TINNED RIVETS always on hand for immediate delivery, if required.

GRAHAM & HAINES, 88 Chambers Street, New York, Agents.

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MANUFACTURERS OF

Davis' Patent Duplex Wrench,

A tool well made of **Best Materials**, combining all the good qualities of a regular Nut Wrench of equal size with that of at least six pairs of Pipe Tongs. For circulars and price lists, address,

PHILADELPHIA TOOL Co., Office & Works, S. W. cor. 13th & Buttonwood Streets, Phila.,
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18 & 20 Cliff Street, and 243 & 245 Pearl Street, New York.

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Carpenters', Coach Makers', Wagon Makers' and Farmers' Drawing Knives.

Socket Firmer, Framing, Slicks and Corner Chisels.

Every Tool Warranted.

Send for our new Catalogue and Price List.

AMERICAN BUTT CO.,

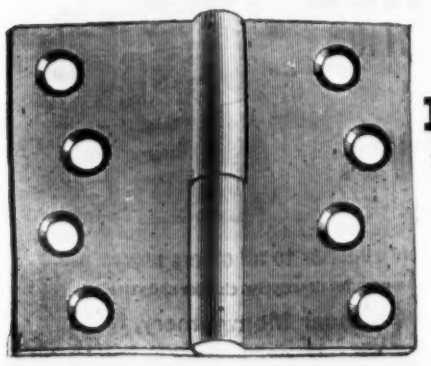
PROVIDENCE, R. I., Manufacturers of

Cast Butt Hinges,

AND

BUILDERS'

HARDWARE.



New York Warehouse with

Messrs. GRAHAM & HAINES,
No. 88 Chambers Street.

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All kinds of

SMALL CASTINGS

made to order.

Cowdin Mfg. Co.,

Manufacturers of the

DIAMOND

FLINT AND EMERY

PAPER,

Flint & Emery Cloth.

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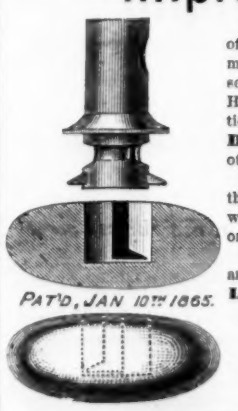
P. O. Box 3502. NEW YORK CITY.

Improved Door Knobs.



On the 10th January, 1865, we obtained Letters Patent for improved method of securing necks to Mineral and Porcelain Door Knobs, which improvement was used by us long enough to prove its utility, but on account of unsettled claim of joint ownership by former partner, its use was discontinued. Having now made a further improvement, for which we have made application for a Patent, we are now making the **BEST SECURED** and **MOST DURABLE** Mineral and Porcelain Door Knobs ever offered in this or other markets.

We solicit orders for these Knobs at our regular prices for old styles, with the understanding that if any can be loosened from or gotten off the necks without breaking the tops, they may be held by the purchaser subject to our order, with expenses added.

See *The Iron Age*, of August 21st,, page 11, for reduced list prices on Locks and Latches; also, for illustrated description of our patent **Telescope Locks and Latches,** with patent Flat **Steel Perforated Keys,**

Address

BRANFORD LOCK WORKS,
Branford, Conn.

Or, THE HART, BLIVEN & MEAD MANUFACTURING CO., Agents,
18 & 20 Cliff and 243 & 245 Pearl Streets, New York

PHILADELPHIA.

(Corrected weekly by Lloyd, Supplee & Walton).

Terms, 30 days. For 60 or 90 days, interest added at 10 per cent. per annum.

Anvils.—Solid Cast Steel.....₱ ℔ 12½c
Peter Wright's.....₱ ℔, gold, 18c @ 12½c
Wilkinson's.....11½c
Eagle.....₱ ℔ 12 cents, currency—dis 10 @ 15 %
Apple Parers.—Reading Improved.....per doz $8 50
Victor, Improved..... " 8 25
Union, " ..... " 8 00
Turn Table, " ..... " 8 50
Discount for 25 dozen lots..... " 50c
Axes.—Mann's Light.....Per doz. $13 00 @ 14 00
Hunt's Light..... " 14 00 @ 14 50
Red Indian, all sizes..... " 12 50 @ 13 00
Red Chieftain, all sizes..... " 13 00 @ 13 50
Crown Prince..... " 13 50 @ 14 00
Augers and Auger Bits.—Pierce's Pat. Twist Bits.....dis 25 %
Bates' & Ives' Bits.....dis 25 @ 30 %
Douglass' Bits.....dis 25 @ 30 %
Cook's Bits.....dis30 @ 30&10 %
Bonney's Pat. Hollow Augers.....dis 25 %
Russell Jennings' Bits.....dis 10 %
Bates' & Ives Nut Augers.....dis 20&10 %
Douglass Nut Augers.....dis 30 %
Watrous' Ship Augers.....dis 10 %
Balances.—Landers, Frary & Clark's.....dis 10 @ 15 %
Chattillon's.....dis 10 @ 15 %
Morton's.....dis 10 @ 15 %
Common Spring, with Hook.....₱ doz $1 38 @ 2 00
Bells.—Bevin Bros. Mfg. Co. Hand Bells.....dis 50&10 %
" Extra Light Hand Bells.....dis 50&10 %
Other makers light.....dis 55 @ 60 %
Connell's Door Bells.....old list net
Western and Kentucky.....dis 50 %
Boring Machines.—Bates' Mfg. Co., complete with augers.....dis 10 @ 15 %
Douglass' Mfg. Co., complete with augers..dis 10 @ 15 %
Common Augers.....$4 25 @ 4 00
Anguar, Extra Auger.....5 50 @ 5 00
Bolts.—Eastern Carriage Bolts.....dis 60&20 %
Western " " .....dis 60&20 %
Philadelphia " .....dis 40 %
Wrought Shutter Bolts.....dis 45 %
Cast " .....dis 35 %
Braces.—Barber's.....dis 40 %
Bartholomew's.....dis 10 @ 15 %
Spofford.....dis 37½ %
Butts.—Cast Fast Joint, Narrow.....dis 40 %
" " Broad.....dis 40 %
Cast Loose Joint.....dis 50 %
" Acorn Drilled.....dis 40 %
Wrought Loose Pin.....dis 25 %
" Table Hinges and Back Flaps.....dis 25 %
" Narrow.....dis 30 %
" Loose Joint.....dis 35 %
Parker's Blind Butts.....dis 40 %; by the case, dis 40&10 %
Shepard's " " .....
Clark's " " .....
Palmer's " " for wood.....dis 45 %; by the case, dis 50 %
Garretson's " " .....
Lull & Porter's " .....dis 25&10 %
Chains.—German Halter.....gold list dis 20 @ 25 %
" Coil.....gold list dis 20 @ 25 %
Galvanized Pump.....₱ ℔ 15c
Best Proof Coil Chain—

₱ ℔.....	13⅛	10¾	10	9¼	9¼	9	8¼c gold
	3-16	¼	5-16	⅜	7-16	½	⅝ in.

By the cask, 560 lbs., discount ½c per lb. Common Chain, ½c per lb. less than proof.
Chisels.—Socket Framing.....dis 60 @ 60&5 %
Socket Firmer.....dis 60 @ 60&5 %
Tang " .....dis 40 @ 40&5 %
Beaty's Framing and Firmer.....dis 10 @ 10&5 %
Casters.—Porcelain Wheel.....dis 20&10 %
Iron.....dis 20&10 %
Brass.....dis 20&10 %
Clothes Wringers.—Universal..... per doz $72 00
Novelty..... " 72 00
Reliance..... " 72 00
Providence..... " 72 00
Orders for 5 dozen, discount $3 per dozen.
King Wringers (Iron Frame).....per doz $68 00
Coffee Mills.—Common Box and Side.....dis 10 @ 15 %
Patent Box and Side.....dis 10 @ 15 %
Cutlery.—American Pocket (best).....dis 20 @ 25 %
Landers, Frary & Clark, J. Russell & Co. and Lamson & Goodnow Mfg. Co. Manufacturers' net prices.
Drawing Knives.—Hart Mfg. Co.'s.....dis 60 @ 60&5 %
Concave Adjustable Handle.....dis 10 %
Beaty.....dis 10 %
Files.—Nicholson Mill Files.....new list, $5 00 to £ cur
Nicholson Bastard " 5 00 to £ cur
" Taper " 5 00 to £ cur
Butcher's Mill.....$5 75 to £ gold
" Bastard.....5 50 to £ gold
" Taper.....5 50 to £ gold
Moss & Gamble—Mill, Taper and Bastard.....5 50 @ 5 25 to £ gold
Fluting Machines.
Royal, No. 1, 4½ inch Rollers.....list $6 00
" No. 2, 6 " .....list 7 00
Hammers and Hatchets.
Yerkes & Plumb's.....dis 10 %
Hammond & Son's.....dis 5 %
Hinges.—Strap and T.....dis 30&7½ %
Bonney's No. 1 Gate.....dis 25 %
" No. 2 and 3.....dis 35 %

Horse Nails.	Nos.	6	7	8	9	10
Ausable		27	25	24	23	22
Globe		29	26	25	24	23
Brundage		26	24	23	23	21
	Nos.	5	6	7	8	9	10
Putnam		32	28	26	25	24	23

On Ausable, Globe and Brundage 1000 ℔ lots.....dis 5 %
Knobs.—Door (regular manufacture).....dis 40 %
Porcelain and Mineral.....dis 40 %
Locks and Latches.—Rim and Mortise.....dis 40 %
Till and Cupboard.....dis 25 %
American Padlocks.....dis 40 %
Trunk Locks.....dis 5 @ 10 %
Thumb and Roggens Latches.....net @ dis 10 %
Mattocks.—Long and Short Cutter.....dis 15 %
Western Pattern.....dis 15 %
Pennsylvania Pattern.....dis 15 %
Molasses Gates.
Enterprise Mfg. Co.'s Measuring Faucets.....dis 20 %
Stebbins' Gates.....dis 60 @ 60&10 %
Lincoln's " .....dis 40 @ 40&10 %
Landers, Frary & Clark's Petroleum.....dis 10 @ 10&10 %
Taylor's Petroleum Faucets.....dis 20 @ 20&10 %
Rakes.—Cast Steel Garden.....dis 30 %
Malleable Garden.....dis 33⅓ %
Wood Head Iron Teeth.....dis 30 @ 40 %
Rules.—Stanley Rule and Level Co.....dis 60 @ 60&10 %
Steven's and Hubbard's.....dis 60 @ 60&10 %
Squares.—Steel and Iron, new list.....dis 50 %
Saws.—Disston's Cross Cut.....dis 12½ %
Disston's Hand.....dis 12½ %
W. McNeece's H'd. Cross-Cut & Circ'r, new list..dis 15 %
Boynton's Lightning, new list.....dis 30 %
Shovels and Spades.
Rowland's Plain Back, list Feb. 1873.....dis 20&10 %
" Back Strap " .....dis 30&10 %
Oliver Ames & Sons.....net list
Brady Shovel Co.....dis 7½ %
Sad Irons.—Reading (planed face).....per lb. 5½c.
Coquanock (polished face)..... " 5c.
Stove Polish.—Gem.....₱ gross, $5 00
Onyx..... " $5 00
Scythes.—Golden Clipper.....₱ doz. $11 50
Clipper No. 10..... " 10 50
Common Scythes.....₱ doz $7 00 @ 10 00
Screws.—Iron.....new list, April 1st, 1873. dis 47½ %
Brass.....dis 50&10 %
Spoons.—Plated Spoons, Rogers Bros.'.....dis 30 @ 25 %
Britannia Spoons.....dis 35 @ 40 %
German Silver.....add to list 5 %
" Light.....dis 5 %
Try Squares.—Disston's.....dis 12½ %
Stanley Rule and Level Co.....dis 40&10 %
Willis Thrall, No. 2.....dis 30&10 %
Willis Thrall, No. 1.....dis 25&10 %
Tacks, &c.—Half Weight Tacks.....dis 67½ %
" by the case.....dis 67&7½ %
Clout and Finishing Nails.....7½ %
" by the case.....dis 7½ %
Traps.—Genuine Oneida—Newhouse list.....dis 20 %
Imitation " " .....dis 20&10 %
Wrenches.—Coes Genuine.....dis 30 @ 30&10 %
Coes Imitation Wrought Bar.....dis 45 %
" " Malleable Bar.....dis 50 %
" " (Kellogg) Malleable Bar.....dis 55 %
Tafts Pattern.....30 %
" " Kellogg's.....dis 60&10 %
Wire.—No. 0 to 18.....dis 30 %
No. 19 to 26.....dis 40 %
No. 27 to 36.....dis 33⅓ @ 35 %
Coppered 0 to 12.....dis 15 @ 20 %
Tinned Broom Wire.....dis 15 @ 20 %

BUFFALO.

Reported by Messrs. Sidney Shepard & Co.
Sept. 5 1873.

Axes, Chopping—"Francis Axe Co "....$13 00 @ $14 50
Augers—C. S. Cut.....dis 30&10 %
Bits, Auger—Pierce's.....dis 25 %
Jennings'.....dis 10 %
Bells, Cow—Yaw's Genuine.....dis 20 %
Bellows—Smiths'.....dis 20 %
Bolts—Carriage and Tire.....dis 70&5 %
Braces, Bit—Barber's.....dis 40 %
Spofford's Patent.....dis 40 %
Brads, Cut.....dis 50&7½ %
Boards—Stove, Brooks' Patent.....dis 30 %
Butts—Brass.....dis 20 %
Cast Loose Joint.....dis 50 %
" " Pin.....dis 40&5 %
" " " Japanned.....dis 40&5 %
" " " Silver Tipped.....dis 25 %
Wrought Narrow.....dis 30 %
" Broad, Loose Joint.....dis 35 %
" Table and Back Flaps.....dis 25 %
Wrought Butts, Loose Pin.....dis 35 %
Belting—Rubber.....dis 20 @ 33⅓ %
Leather, new list.....dis 30 @ 30&5 %
Beaters, Egg, "Peerless".....per doz $4 50
Brick—Bath (box of 2 doz) Best English.....$1 50
"Rutherford".....$1 25
Bung Borers—"Enterprise".....dis 20 %
Chalk—White, Carpenter's.....₱ gross, 60c
Red, Carpenter's " 80c
Blue, " " 90c
Crayon School " 14c
Chisels—Firmer Socket.....dis 60&10 %
Framing Socket.....dis 60&10 %
Corner Socket Chisels.....dis 60&10 %
Slick's Carpenters'.....dis 60&10 %
Castings—Malleable.....₱ ℔ 10½c
Cherry Seeders.....per doz $12 00
Elbows—Corrugated.....5 5½ 6 7 dis 10 %
Charcoal.....$4 25 5 25 5 25 6 50
Russia.....10 00 13 00 13 00 14 00
Flies—Wheeler, Madden & Clemson's.....dis 42½ %
Freezers, Ice Cream—"Champion".....dis 33⅓ %
Gates—Molasses—
Patent Self-Measuring.....₱ doz., $42 00; dis 20 %
Hinges—Window Blind—
Clark's No. 20.....dis 50&5 %
Shepard's Standard, and Clark's.....dis 40&10 %
Garretson's.....dis 40, 10&10 %
Wrought Strap and T.....dis 30&7½ %
Hods, Coal—Plain, Black and Galvanized.....net @ 10 %
Funnel, Black and Galvanized.....net @ 10 %
Palace Coal Vases.....net
Fancy and Helmet.....net @ 10 %
Hammers—Maydole's.....net
Yerkes & Plumb's.....dis 5 @ 10 %
Hooks and Staples—Wrought.....dis 50 %
Hooks—Belt.....dis 50 %
Hasps and staples—Wrought.....dis 60 %
Sad Irons.....₱ ℔ 3c
Kettles—Brass.....₱ ℔, 50c
Enameled.....new list dis 40 %
Knives, Drawing—Oval No. 1.....dis 60&10 %
Razor Blade.....dis 50&10 %
Lanterns "Peerless,".....No. 1 5 10
₱ doz $26 00 $11 25 $13 75 dis 10 %
"Radiant".....No 75 100 150 175
₱ doz $13 13 $13 13 $22 50 $22 50 dis 20 %
Tubular.....$13 00
" with Guards.....13 50
Machines—Apple Paring, "Reading."....$3 50 ₱ doz
Mills, Coffee—Box and Slide, common.....dis 15 %
Box Union and Eagle.....dis 15 %
"Enterprise".....dis 20 %
Nails—Cut, Chesapeake.....$4 50
Clout and Finishing.....dis 7½ %
Shoe.....dis 7½ %
Horse, Ausable.....No. 5 6 7 8 9 10
" " 30 27 25 24 23 22c
" " Finished & Pointed.....add 1c ₱ ℔
" " 1000 lbs.....dis 5 %
" Clinton.....No. 6 7 8 9 10
22 20 19 18 17c
Packing—Rubber.....dis 30 @ 33⅓ %
Pencils, Slate—Soapstone.....4 5 6 in.
30 40 50c. ₱ 100
Case lots.....dis 20 %
Paint—White Lead, U. S. Gov't.....₱ ℔ 9½c
Rivets—Iron. Black and Tinned.....dis 20 @ 25 %
Copper.....dis 10 %
Rope—Manila, ¼ inch and larger.....₱ ℔ 17½c
Rules—Boxwood and Ivory, Stephens.....dis 50&10 %
Screws—"American Screw Co"—
Flat Head, Iron.....dis 47½ %
Flat Head, Brass.....dis 60 %
Staples—Blind, Boardman's Pat., ¼ & ⅜.....₱ ℔ 37½c
Skates—White's.....dis 20 %
Straps, Skate—Russet and Black.....net @ 20 %
Spoons, Iron Tinned.....dis 10 %
" by the case.....dis 20 %
Plated Rogers' A No. 1.....dis 20&5 %
Britannia.....dis 40 %
Squares—Steel and Iron.....new list 50 %
Shoes, Horse—H. Burden & Sons.....₱ keg $6 50
Shovels & Spades—Shepard, Forsyth & Dennison..dis 20 %
Saws—Henry Disston & Sons.....dis 10 %
Scales—Buffalo Scale Works.....dis 25 %
Fairbanks.....dis 15 %
Shears—Seymour's.....dis 50@1 %
Traps, Steel—Newhouse.....dis 20 %
Tacks—Half Weight Am. Iron.....dis 67½&7½ %
Vises—Parallel, Buffalo.....dis 15 %
Wrenches—Coes' genuine.....dis 30&10 %
Coes' Imitation.....dis 50&10 %
Tafts' Pattern.....dis 65&10 %
Ware—French, Tinned and Iron.....
Stamped and Japanned.....
Cast Iron Hollow.....dis 20 @ 25 %
Tin Plates.—Add for each X.....2·50

10x14, IC. Charcoal	$13 25	14x20 C. terne	$12 25
12x12, "	13 75	20x28 C. "	25 75
12½x17, "	12 75	20x28 X. "	25 50
14x20, "	14 25		

Pig Tin—Straits.....32c @ 40
Banca.....45c @ 46
Bar Tin.....41c
Solder.....No. 1, 21½c; No. 2, 19½c
Sheet Zinc—
"Lasalle".....570 300 200 100 ℔ casks
11·00 $11·20 $11·20 $11·30 ₱ 100 ℔s
Iron Wire—Bright and Annealed.....dis 27½ %
Coppered.....dis 22½ %
Tinned.....dis 15 %
Tinned Broom, Nos. 20 21 22 dis 20 %
20c 21c 21c
Copper—Sheathing 14 @ 18 oz.....₱ ℔ 37c
Planished.....₱ ℔ 44 @ 46c
Bottoms.....₱ ℔ 39c
Bolts.....₱ ℔ 40c
Braziers' Sheets.....₱ ℔ 40c
Sheet Iron.—
18 Common.....$5 80
24 Common.....6 00
24 W. D. Wood & Co., Smooth Finish.....7 25

Am. Russia	A.	B.
	14c	12c

Gen. Russia, No. 1 stained.....31c
" clean.....22c
Galvanized.....dis 20 %

PITTSBURGH.

Card Rates, 60 days.

Flat Bar —
1¼ to 4 x ⅜ to 1 inch..3·8c
4¼ to 6 x ⅜ to 1 inch..4·0c
1¾ to 6 x 1¼ to 1½ in..4·2c
Horse Shoes.—
All sizes.....5·3c
Heavy Bands.—
3½ to 6 x ½ & 5-16 in..4·4c
1½ to 3¼ x ½ & 5-16 in..4·5c
Light Bands.—
3 to 6 x 3-16 to No. 12..4·8c
1½ to 2¾ x 3-16 to No. 12.....5·0c
Hoops.—2¼ to 3 in....5·1c
3¼ to 4¾ in.....5·3c
1¾ to 2 in.....5·3c
1⅝ to 1 11-16 in.....5·6c
1⅛ & 1¼ in.....5·9c
Round and Square.—
1 to 1¼ in.....4·8c
2 to 2¾ in.....4·1c
3 to 3½ in.....4·3c
3¾ to 4 in.....4·8c
⅝ to 9-16 in.....4·2c
Oval Iron.—
⅝ to 1¼ in.....4·4c
⅜ to ½ in.....4·6c
Half Oval and Half Round.—
⅝ to 1¼ in.....4.7c
⅜ to ½ in.....5·2c

Sheet Iron, 10 to 14	5·4	6·9	8·4
" 15 to 20	5·6	7·1	8·6
" 21 to 24	5·8	7·3	8·8
" 25 to 26	5·9	7·5	9·0
" 27	6·2	7·7	9·2

All sheets over 28 in. wide, ½c. ₱ ℔ extra.
Tank Iron —
3-16, ¼ & ⅜ in. thick..5·6c
Boiler Plate Iron....7·5c
Heads net flanging....6·7c
Railroad Iron—Countersunk and Punched.—
1¼ x ⅜, 7-16 & ½ in ...5·2c
1¼ x ½ & 5-16 in.....5·7c
Extras for Cutting to Length.—
Flat bars and rounds and squares.....1c
Flat bars for tire.....1c
Heavy bands.....3c
1¼ & 1½ x ⅜ to ½ in....4·0c
1 & 1¼ x ¼ to ⅜ in.....4·1c
⅞, ½ & ⅝ x ⅜ to ½ in...4·2c
Nail rods.....7·7c
¼ to 1¼ x ¼ & 5-16 in....4·8c
⅛ to ¾ x ¼ & 5-16 in....5·0c
1 to 1¾ x 3-16 to No. 12..5·4c
½ to ¾ x 3-16 to No. 12..6·0c

1 in	6·3c
⅞ in	6·8c
¾ in	7·3c
⅝ in	7·8c
½ in	8·3c
⅜ to 7-16	4·5c
⅜ in	4·6c
5-16 in	5·0c
¼ in	5·4c
3-16 in	7·4c

	Rolled.	Charcoal.	Jun.
Heads flanging	4·5c	6·0c	
Plow Slubs	6·4c		
Plow Wings	6·9c		
⅛ in	4·8c		
⅜ in	5·4c		
½ in	5·9c		
⅝ in	7·4c		
Nail rods	7·7c		

Nails—Standard list.....$4 75

The following are the Card rates of Lewis, Oliver & Phillips:

Iron, standard list, assorted sizes, for large orders, 3·8c, card rate, 2 % off net.
Iron Wedges.....5½c ₱ ℔ net
Norway Nail Rods.....9½c ₱ ℔ net
Fence Pickets—
⅜ round, bent to shape.30c ₱ ft. of fence, less 5 % off net
Discount off Standard List.
Carriage and Tire Bolts (new list).....60&15 % off net
Plow Bolts.....25 % off net
Stove Bolts.....at the list price
Machine and Square Head Bolts.....25 % off net
Coach and Lag Screws.....25 % off net
Bolt Ends.....30 % off net
Pat. Hot Pressed Square and Hexagon Nuts, small sizes, from 3-16 to ⅜ in.....6 c ₱ ℔ off net
Pat. Hot Pressed Square and Hexagon Nuts, large sizes, from 7-16 to 2 in.....4½c ₱ ℔ off net
Washers, all made from new band iron, small sizes, from 3-16 to ⅜ in.....7 c ₱ ℔ off net
Washers, all made from new band iron, large sizes, from 7-16 to 1¾ in.....5 c ₱ ℔ off net
Nuts and Washers in 25 lb. boxes, 1c ₱ ℔ ex. Nuts and Washers in lots less than one keg each size, 1c ₱ ℔ ex.
Harrow Teeth, in lots of 1 ton or more, packed in casks, 1 in. diam. 5c ₱ ℔ net; ⅞, ¾ in. diam. 5c ₱ ℔ net; ⅝ in. diam. 5½c ₱ ℔ net.
Patent Headed Harrow Teeth, packed in casks, ½c ₱ ℔ ex
Skein Bolts, in bulk, in lots of 5 kegs or more, ⅝ in. diam. 8c ₱ ℔ net; 9-16 in. diam. 9c ₱ ℔; ½ in. diam. 10c ₱ ℔. 1c ₱ ℔ extra when less than 1 keg of each size is ordered.
Screw Hook-and-Eye Hinges, ¾ to 1 in. diam. 9½c ₱ ℔ net; ⅝ in. diam. 10½c ₱ ℔ net; ½ in. diam. 12½c ₱ ℔ net.
Screw and Strap Hinges, in lots of 100 pairs or more, 14 to 16 in. long 7c ₱ ℔ net; 8, 10 & 12 in. long, 8½c ₱ ℔ net.
Strap and T Hinges.....20 % off net, delivered
Screw Hitching Rings.....$6 50 ₱ 100 net
Duck Nest Tuyere Irons.....$16 00 ₱ doz net
Cast Iron Washers.....₱ ℔ 4½c net
Bridge and Roof Bolts—
1 to 2 in. diam. over 8 ft. long.....₱ ℔ 5½c net
1 to 2 in. diam. from 4 to 8 ft. long....." 6½c net
1 to 2 in. diam. from 1½ to 4 ft. long....." 6 c net
⅞, ¾ and ⅝ in. diam. over 4 ft. long....." 6½c net
⅞, ¾ and ⅝ in. diam. from 1½ to 4 ft. long " 6½c net

WAGON HARDWARE.

Wagon Box Strap Bolts—

10 in. long by 7-16 at Screw End, ₱ set of 8 bolts..	55c
12 " ½ " " " 8 " ..	70c
10 " 9-16 " " " 8 " ..	90c
12 " 9-16 " " " 8 " ..	
14 " 9-16 " " " 8 " ..	$1 00
10 in. long by ⅝ at Screw End, ₱ set of 8 bolts..	1 00
12 " ⅝ " " " 8 " ..	
14 " ⅝ " " " 8 " ..	1 10
16 " ⅝ " " " 8 " ..	1 20

5c ₱ set for each additional inch over 14 in. made. All lengths

Wagon Box Rods, narrow track, each.....18c
" " wide track, each.....20c
Single Tree Irons, ₱ set of four pieces.....88c
Wrought Iron Bolster Plates, 2¾ in. wide, ₱ set.....60c
" " " 3 " " 60c
" " " 3½ " " 70c
" " " 3½ " " 70c
Wagon Brake Ratchets, each.....6½c
" " finished with guard, each..45 c
Wrought Hammer Straps, heavy pattern, each.....16 c
" " light " each.....13½c
" Rub Irons, each.....11 c
Stay Chain Hooks, each.....8 c
Double and Single Tree Clips, figure 1, each.....9 c
" " " 2, each.....10 c
" " " 3, each.....12 c
Strap Bolts, Rods, Single Tree Irons, Bolster Plates, Brake Ratchets, Hammer Straps, Rub Irons, Stay Chain Hooks and Clips, in lots of 100 sets.....dis 25 %
Wagon Box Staples, 1½ to 2½ in. to clinch..₱ 1000 $13 50 net
" " Box Iron, to rivet on.₱ 1000 9 50 net
Neck Yoke Eyes, each.....5½c net
" " with ⅜ rings, each.....8½c net
King Bolts, ⅝, 1, 1¼, and 1½ in. diam.....₱ ℔ 5½c net
Wagon Rivets, ex. large, oval and steeple head, ¼ in. diam. all lengths.....₱ 10 c net
Wagon Rivets, 3-16 in. diam., all lengths.....₱ 12 c net
" " & Nails, in 5 ℔ paper boxes....₱ ℔ 1c extra
" " in 25 ℔ wood. " 3c extra
Wagon and Hinge Nails, ¼ in.....₱ ℔ 17 c net
" " " 3-16 in....." 19 c net
Double Tree Plates.....
Coupling " .....} " 9 c net
Tongue " .....
Neck Yoke Plates..... " 12 c net
Tongue Cap Iron, 1¾, 2 & 2¼ in. wide, same price ₱ ℔ as **Band Iron.**
Wagon Chains, Stay Lock and Tongue, 5-16 in. ₱ ℔ 11½c net; ¼ in., 12½c. net

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Manufacturers of
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Odd and irregular sizes made to order or cut from sample at short notice. Send for Price List.

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Hungarian and Cigar Box Nails;
COPPER and IRON BOAT NAILS
ZINC, COPPER, STEEL, and IRON SHOE NAILS
2d and 3d FINE NAILS;
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RIVETS.
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CHEAPEST & BEST WHEEL MADE.
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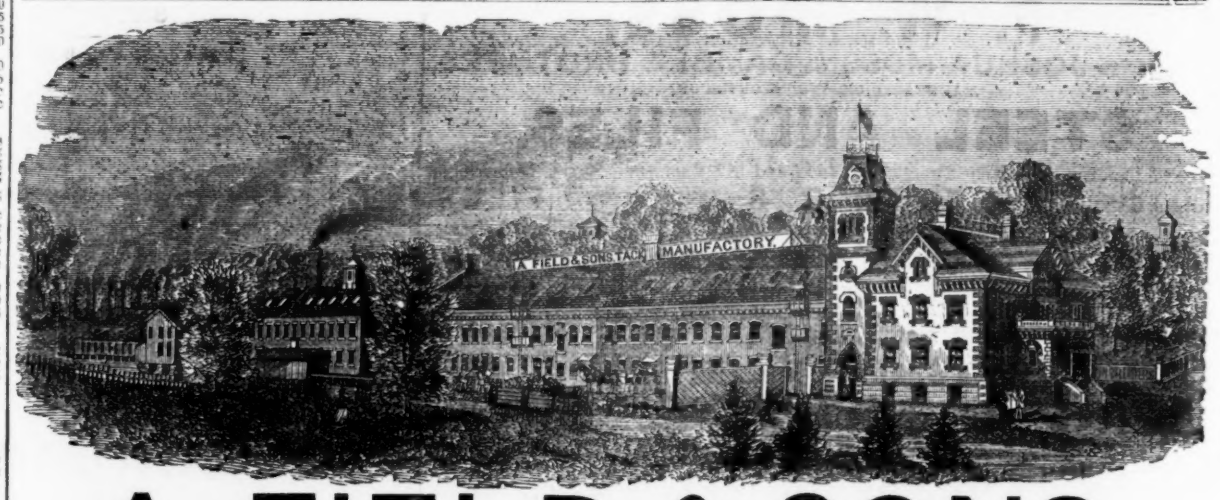

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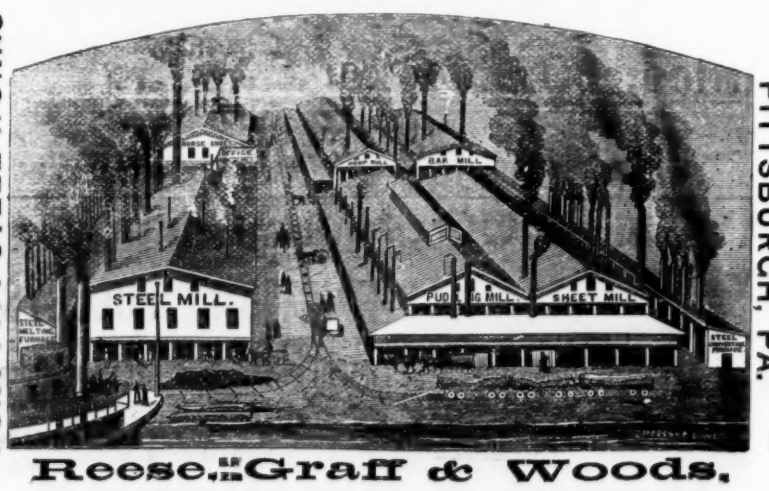

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Communications should be addressed to the

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JAMES A. WHITNEY, Patent Agent and Expert, offers his service to inventors in securing **American and Foreign Patents,** as expert in patent cases, etc.

"We take pleasure in commending the new agency to the favor of inventors." *The Iron Age*, June 6.

"Of Prof. James A. Whitney we can speak from a personal acquaintance. Any person seeking professional advice from him will be certain of just and honorable treatment." Norwich, Conn., *Daily Advertiser* May, 29.

"His long experience in this field of investigation has made him familiar with the business in all its branches, and we can confidently recommend him to those needing his services." *Prairie Farmer*, Chicago, June 1.

"Few persons have had more opportunities for learning the necessities of such a business." *The World* (weekly), New York City, June 19.

"A thorough mechanical engineer with a valuable practical experience in the machine shop." *Am. Railway Times*, Boston, June 8.

"Mr. Whitney is qualified by experience and practical knowledge. His life and experience have been such as to develop the fullest sympathy with men engaged in industrial pursuits, especially inventors. *Moore's Rural New Yorker*, June 8.

Address, for full information, free of charge,
128 Broadway, Room 11, New York City.

BOSTON.

(Reported by Macomber, Bigelow & Dowse, 42 to 48 Batterymarch St.)

Axes.—Forester's Favorite, Bronzed....$13 00
Blue Jackets, Blue....12 50
Excelsior, Red....12 00
Chopper's Pride, Bronzed....11 00
Red Cross, Red....10 50
Red Cross, Handled....13 50
Boy's Handled Blue Jackets....12 00
Bells.—Hand....dis 60&10 %
Sleigh, fancy body straps, patent leather, cloth bound, W. M., 30 bells, No. 1....per strap $1 70
Sleigh, patent leather, cloth bound, W. M., 36 bells, No. 1....per strap, $1 80
Sleigh, patent leather, leather bound, ex. tinned, 30 bells, No. 1....per strap $2 38
Sleigh, patent leather, leather bound, ex. tinned, 36 bells, No. 1....per strap $2 50
Sleigh, patent leather, leather bound, silver plated, 30 bells, No. 1....per strap $3 38
Sleigh, patent leather, leather bound, silver plated, 36 bells, No. 1....per strap $3 50
Sleigh, shaft straps, W. M., House, 6 bells, No. 1....per pair 75c
Bevels.—Star Tool Co....dis 33⅓ %
Bits.—Auger, Pierce's....dis 30&5 %
Auger, Jennings'....dis 10 %
Bolts.—Carriage, Common, new list....dis 65&10 %
Borers.—Angle, Backus'....dis 30 %
Boring Machines.—Angle....each $5 25
Common, Snell's quality....each 4 00
Breast Drills.—Miller's Falls, $30 per doz....dis 25 %
Braces.—Barber's....dis 40 %
Backus's....dis 45 %
Spofford's....dis 40 %
Butts.—Union Drilled Loose Joint....dis 45 %
" " Wire Fast Joint....dis 35 %
" " Acorn Loose Joint....dis 35 %
Alden's Drilled Plain, Reversible....dis 35 %
" " Acorn, " ....dis 25&10 %
Wrought Table Butts and Back Flaps....dis 25 %
Wrought Narrow Butts....dis 30 %
Castors.—Revised List....dis 20&10 %
Chisels.—
Socket Framing M., B. & D's, warranted...dis 60&10 %
Cordage.—Manila....₩ lb, 18c
American Tarred Hemp Lath Yarn....₩ lb, 10c
Corn Hooks.—Extra Quality, Strapped...₩ doz, $2 75
Cow Ties.—
No. 30, open ring, 3 ft., No. 6, with toggle...₩ doz $3 37
No. 35 " 3 ft., No. 6 " snap....₩ doz 3 62
No. 40 " 3½ ft., No. 5 " toggle...₩ doz 3 75
No. 45 " 3½ ft., No. 5 " snap....₩ doz 4 00
No. 50 " 4 ft., No. 4 " toggle...₩ doz 4 25
No. 55 " 4 ft., No. 4 " snap....₩ doz 4 50
No. 60 " 4½ ft., No. 3 " toggle...₩ doz 4 50
No. 65 " 4½ ft., No. 3 " snap....₩ doz 4 75
Crow Bars.—Iron, Steel Points....₩ lb, 6½c
Enam. Ware.—Kettles....dis 25 %
Files.—Esarl Smith & Co.'s English....$5 to £ gold
American....$5 to £ currency, less 10 %
Nicholson....$5 to £ currency, less 7½ %
Funnel Irons.—$2·50 $2·50 $2·50 $3·25 per doz
5, 5½, 6, 7 inch
Deep Flange, $3·50 $3·50 $3·50 per doz
5, 5½, 6 inch
Gauges.—Star Tool Co....dis 33⅓ %
Hammers.—Maydole....dis 5 %
M., B. & D., solid cast steel, adze eye, No. 1, $10; 1½, 8·75
" " " " " bell face, No. 1, $11; 1¾, $9·75.
Hangers & Rollers.—Novelty....dis 30 %
Hatchets.—Underhill Edge Tool Co....dis 10 %
Underhill pattern, solid, C. S. lathing....$9 50
Hinges.—Strap and T, Stanley Works....dis 30&7½ %
Plate, Loose, and Fast Joint....₩ lb, 8c
Wrought Screw Hook....₩ lb 8c
Locks.—P. & F. Corbin....dis 40 %
No. 408, Iron Face and Bolts, Mortise, 3¼ inch, per doz net....$1 88
No. 1000, reversible rim knob....$2 25
Mattocks.—K. P. & Co., axe finish, long cutter..$13 75
Short cutter....13 50
Metal.—Babbitt, No. 1, 35c; 2, 25c; 3, 16c; 4, 15c ₩ lb
Nails.—10d and larger....$4 75
Paper.—Finest Quality Manila....₩ lb 11c
Papers.—Reading, New Pattern....per doz $8 00
Turn Table....per doz 8 50
Picks.—K. P. & Co., Polished Points—
5 to 6....per doz $10 00; 6 to 7, $10 50
Pulleys.—Clark & Co.'s Axle, 1¾ in.—
....per doz 37c.; 2 in., 42c
No. 115, Axle, 1¾ in....per doz 37c
Plated Ware.—Rogers Bros.:—
Under $300....dis 30 %
Over $300....dis 20&5 %
Pocket Knives.—Connecticut Cutlery Co...dis 33⅓ %
Rivets.—Black....dis 25 %
Carriage, oval head, Nos. 3, 4, 5, 6, 7, 8,
13 13 14 14 15 16c ₩ lb net
Rules.—Stephens & Co....dis 60 %
Saws.—Disston's....dis 12½ %
Lightning X cut, Boynton's....per foot 7c
" Saw Blades, 32 inch....per doz $7 00
" Framed Saws....per doz $10 00
Common " " ....per doz 6 00
Disston " " ....per doz 9 00
One man X cut.—Lightning....per foot 8½c
Disston's $3·00 each....dis 12½ %
Screws.—American Screw Co....dis 47½ %
Shovels.—O. Ames....dis 2½ %
M. B. & D....dis 5 %
Sinks.—Cast Iron, 2, 2½, 3, 3½, 4, 4½ feet,
$1·37 $1·62 $2·25 $2·75 $3·75 $4·75 each.
Tools.—Aiken's Pattern, 20 in set; Miller's Falls, $12·00 per doz....dis 15 %
Traps.—Oneida....dis 30 %
Blake's....dis 20&5 %
Try Squares.—Star Tool Co....dis 33⅓ %
Vises.—K. P. & Co.'s Solid Box, Blacksmith...₩ lb 15½c
Parker's Parallel....dis 5 %
Backus....dis 25 %
Weights.—Window Weights....₩ lb 2¾c
Wrenches.—Coe's Genuine Wrenches....dis 40 %
Wringers.—
Novelty and Universal, Tub No. 2, less than 5 doz..₩ doz $ 72 00
5 doz..₩ doz 69 00
10 doz..₩ doz 67 00
Novelty Bench, No. 4, less than 5 doz..₩ doz 108 00
5 doz..₩ doz 104 00
10 doz..₩ doz 101 00
Zinc.—Sheet....₩ lb 10½c

Boston Metal Market.

(Corrected by Fuller, Dana & Fitz.)

Tin Plates.—	₩ box	I. C. Coke	@ $12 00
I. C. Charcoal..	@ $13 50	Terne....11 50	@ 13 00
Pig Tin.—	₩ lb	Straits, gold....	32c
Banca, gold....	31c	English "	32c
Copper.—	₩ lb	Braziers	40c
Sheathing....	38c	Ingot....	28c
" Yellow	c	Old....	36c
Bolt....	40c	Sheet and Pipe....	9·45c
Lead.—	₩ lb	Old....	6½c
Spanish Pig, gold	6½c	American, gold....	7c
Spelter.	₩ lb		
Silesian, gold....	8c		
Zinc.—Sheet....			₩ lb 10½c
Iron.—Sheet Iron, Russia, gold....			₩ lb 18c
Sheet Iron, English....			" 7c
" " American....			" 7½c
" " Galvanized....			" 11c @ 13c
Swedes Bar Iron, Flat, gold....			₩ ton, $145 00 @ $155 00
" Shoe Shapes, gold....			155 00 @
Norway Bar Iron, Flats, gold....			145 00 @ 152 00
" Shapes, gold....			155 00 @
" Round, 2 in. to ⅝ in., gold....			147 50 @ 152 50
" " 11-16 to ⅝ in. "			162 50 @
" " 5-16 to ½ in. "			165 00 @
" Nail Rods, Rolled "			177 50 @
" " U. B. "			172 50 @
" " Benzon "			167 50 @
" " Vasa "			160 00 @
" " N I W "			160 00 @
English Refined Bar Iron....			87 50 @
Scotch Pig Iron....			40 00 @ 45 00
American "			38 00 @ 48 00
Wrought Scrap Iron....			45 00 @
Steel.—	₩ lb	German	11c
Eng. Tool, gold	16c	Spring....	9c
" Mach. "	10c	Tire....	8c
American Tool	16c	Sleigh Shoe....	6½c
" Mach	11c	Toe Calk....	8½c
Bessemer....	8½c @ 9½c		

ST. LOUIS.

Corrected weekly by Semple, Birge & Co.

Anvils.—Armitage....₩ lb, gold, 16c
Peter Wright's.... " 14½c
Wilkinson's.... " 12½c
Apple Parers.—Conqueror....₩ doz, $9 00
Lightning.... " 9 00
Turn Table.... " 9 00
Augers and Bits.—Cook's....dis 25 %
Ives'....dis 20 %
Jennings'....dis 5 %
Snell's....dis 12½ %
Axes.—Hunt's....₩ doz $14 50 @ 15 50
Lippincott's.... " 14 00 @ 15 00
Lippincott's Pioneer.... " 14 50 @ 15 50
Simmons'.... " 13 50 @ 14 50
Axles.—Kritch & Crane Mfg. Co.'s—
Patent Taper Axles....dis 10 %
Swelled Taper Axles....dis 10 %
Concord Axles....dis 10 %
Red Jacket Axles....dis 10 %
Common Axles, 1¼ inch and upward....₩ lb, 8½c
" " less than 1¼ inch.... " 9½c
Bells.—Troy, Church....₩ lb, 50c
Light Brass, Hand....dis 50 %
Moore's, Cow....dis 10 %
Bolts.—Arms, Bell & Co.'s Machine....dis 10 %
Arms, Bell & Co.'s Carriage and Tire....dis 60& 20%
Norway Iron Carriage and Tire....dis 40 %
Cast Iron Barrel, Shutter, &c....dis 25 %
Cast Butt Hinges.—Narrow Fast Joint....dis 25 %
Broad Fast Joint....dis 40 %
" Loose " ....dis 50 %
Reversible....dis 45 %
" Japanned and Silver Tipped....dis 40 %
Loose Joint "Acorn" " " ....dis 40 %
Excelsior Reversible Blind....dis 30&10 %
Lull & Porter's Blind....dis 35 %
Wrought Butts.—Narrow....dis 20 %
Reversible....dis 25 %
Broad....dis 25 %
Table Hinges....net list
Back Flaps....net list
Inside Blind Hinges....net list
Casters.—Porcel'n Wheel Bed or Plate..rev. list dis 15 %
Iron or Brass Wheel Bed or Plate....
Chain.—Eng. Coil..3-16 ¼ 5-16 ⅜ 7-16 ½ in.
14 11½ 10¾ 10 9½ 9c gold
Trace....6½-10-2 75c "
7-10-2 80c "
German Coil and Halter....new list add 25 % "
American Coil—Short Link.
Size, inches....⅜ 7-16 ½ 9-16 ⅝
Price cents ₩ lb....12½ 12½ 10½ 10 9½ net
Size, inches....11-16 ¾ 13-16 ⅞ 15-16
Price, cents ₩ lb....9½ 8¾ 8¾ 8½ 8¾ net
Size, inches....1 1 1-16 1¼ 1 3-16 1¼
Price, cents, ₩ lb....8½ 8¾ 8 7¾ 7¾ net
All larger sizes same price as 1¼ in. Stud chain 1c less than same size close link.
Chisels.—Socket, Firmer or Framing....dis 55 %
Clothes Wringers.—Colby's....₩ doz $66 00
Novelty.... " 72 00
Universal.... " 72 00
Monitor.... " 72 00
Coffee Mills.—Parker's....net list
P. S. W. & Co.'s....net
Corn Knives.—Dunn E'ge T'ol Co.'s Clip...₩ doz $5 75
Disston's.... " 6 00
Crow Bars.—Steel Pointed....₩ lb 8 @ 10c
Solid Cast Steel.... " 20c
Cutlery.—J. Russell & Co.'s....
Lamson, Goodnow & Co.'s.... } new list, dis 15 %
Landers, Frary & Clark's....
Files and Rasps.—
Nicholson's Mill Files....$5 50 to the £, currency
Nicholson's Other Files.... 5 00 to the £, currency
Butcher's Files.... 7 00 to the £, currency
Heller's & Bros. Horse Rasps... 5 25 to the £, currency
Forks and Hoes.—
Auburn Mfg. Co.'s Hay and Manure Forks....dis 25 %
" " Handled Hoes....dis 20 %
" " Planter Eye Hoes....add 20 %
Winsted's Planter Eye Hoes....add 20 %
Hammers.—Yerkes & Plumb....new list net
Masons' Hammers....₩ lb 20c
Smith Hand Hammers.... " 22c
Handles.—Axe.... Extra. No. 1. No. 2. No. 3.
$2·75 $2·25 $1·75 $1·00
Pick.... Extra. No. 1. No. 1½. No. 2.
$2·50 $2·00 $1·75 $1·25
Smith & Montrose Fork, Hoe and Rake....dis 10 %
" " Broom and Mop....$12 @ $18 ₩ M.
Harrow Teeth.—1 inch Iron....₩ lb 5½c
⅞ and ¾ inch iron.... " 5⅝c
⅝ inch Iron.... " 5¾c
Barbed or Headed....½c extra
Hatchets.—Hunt's....net list
Simmons'....dis 5 %
Hay Knives.—Lightning....₩ doz $22 00
Dunn Edge Tool Co.'s....₩ doz $14 50—dis 15 %
Fisher's.... " 16 50—dis 10 %
Hinges.—Strap and T—St. Louis make....dis 25 %
Horse Nails.—Eureka....22c rates
Ausable....22c "
Northwestern....22c "
Eagle....19c "
National Patent Pointed....21c "
" " " Extra Finished....22c "
Horse Shoes.—R. I. (Perkin's pat.)....₩ keg $7 00
Burden's.... " 7 00
Mule Shoes....$1 00 extra
Rhode Island Trotting Shoes....2 50 "
Locks and Latches.—
Jones & Nimick's....revised list dis 40 %
Moorhead, Adams & Co....dis 35 %
Norwalk Lock Co.'s revised list....dis 33⅓ %
Mattocks and Grub Hoes.—
Klein, Logan & Co.'s Mattocks....₩ doz. $15 00 @ 16 00
" Grub Hoes, Oval Eye....₩ doz. 12 00 @ 13 00
Nails.—Wheeling....$4 75 rates.
Orders for 100 kegs 10c ₩ keg less.
Picks.—Klein, Logan & Co.'s R. R. and Clay ₩ doz.$12 00
Klein, Logan & Co.'s Coal.... " 9 75
" " Poll.... " 12 00
" " Stone.... " 16 50
" " Tamping.... " 19 00
Planes.—Ohio Tool Co.'s....dis 10 %
Eastern....dis 20 %
Post Hole Augers.—Clark's Patent—
No. 1, ₩ doz. $27; No. 2, $30; No. 3, $32....dis 30 %
Barton's Patent....₩ doz $25—dis 20 %
Vaughn's " ....25—dis 10 %
Sad Irons.—Monitor Brand, Silver Polished....₩ lb 6c
Sash Weights.—Standard Solid Eyes....₩ lb 3½c
Saws.—Disston's....dis 10 %
Spear & Jackson's....$5 00 to £ gold
Hubbard, Lippincott, B. & Co.'s....dis 10 %
Branch, Crooks & Co.'s....dis 10 %
Livingston's Patent Buck....net list
Screws.—American Screw Co.'s revised list....dis 45 %
$2000 worth in 6 months....2½ % extra
Scythes.—Blood's C. S. & G. S....net list
Dunn Edge Tool Co.'s, Factory List....dis 15 %
Paris Furnace Co.'s....dis 25 %
Waldron's English....$10 00 to £
Scythe Stones.—No. 1 Ind'n Pond ₩ gr's, $7 00
Extra Indian Pond.... " 7 50
Premium.... " 9 50 } dis 25 %
Diamond Grit.... " 13 50
Shovels, Spades and Scoops.—Ames'..add $1 to list
Lippincott's....new list net
Rowland's, Maxwell....revised list net
Sledges.—Smith's Stone or Coal Sledges—
Steel Face Polished....₩ lb, 17c
Solid Cast Steel.... " 35c
Striking Sledges....₩ lb extra, 1c
Snaths and Cradles.—....dis 20 %
Springs.—Cleveland Spring Co.'s—
Carriage and Express....dis 5 %
Blue Seat Springs....new list dis 10 %
Tacks.—Norway Tack Co.'s ½ weight....dis 67½ %
Brads....dis 50 %
Traps.—Newhouse Patent....dis 15 %
Reichard's Animal, Wood Bottom....₩ doz $10 00
" " Metal Bottom.... " 12 00
Vises.—Solid Box....₩ lb 10c
Wilson Mfg. Co.'s....dis 15 %
Wrenches.—Coes' Genuine....dis 30 %
Coes' Pattern....dis 40 %
Taft's....dis 50 %

St. Louis Metal Market.

(Corrected Weekly by Messrs. R. Sellew & Co.)

Tin Plate.

IC, 10x14, Charcoal...	$14 00	IX, 20x28, Terne....	$32 00
IX, 10x14, "	17 00	IC, continuous,	
IC, 12x12, "	14 50	20 in. x 200 ft....	36 00
IX, 12x12, "	17 50	IX, continuous,	
IC, 14x20, "	15 00	20 in. x 200 ft....	34 00
IX, 14x20, "	18 00	IC, 10x14, best Coke..	13 50
IC, 14x20, Terne....	13 50	IC, 10x14, good " ..	13 00
IX, 14x20, "	15 50	IC, 10x20....	20 00
IC, 20x28, "	27 00	IC, 14x20....	13 50

Block Tin.

Large Pigs....	42c	Bars....	44c
Small "	43c		

Sheet Zinc.

Casks....	₩ lb 11c	Sheet....	₩ lb 11½c

Solder.

No. 1, Refined, in bars or plate....	22c
No. 2, " " "	21c
Pig Lead....	8c

Sheet Copper.—18 to 100 lbs. Sheets 30x60....40c
14 to 16 lbs., Sheets 30x60.... " 42c
10 to 12 lbs.. " and 30x72.... " 45c
6 to 9 lbs.. " " " .... " 48c
Tinned, 14 and 16 oz. 14x48.... " 38c
Planished, 14 and 16 oz. 14x48.... " 40c
" No. 7, 8 and 9.... " 48c
Copper Bottoms.... " 40c

Sheet Iron.—

	Com'n.	Sm'th.	Char'l.	Jan.
No. 16 to 20....	6½c	7½c	8¾c	
No. 22 to 24....	6¾c	7¾c	8¾c	
No. 26....	6¾c	7¾c	9c	11¼c
No. 27....	6¾c	7¾c	9¼c	11¼c

Galvanized Iron....dis 25 %
Iron Rivets....dis 15 @ 20 %
Iron Wire....dis 25 %
Coppered Pail Bail Wire....dis 10 %
Copper Rivets and Burs....dis 10 %
Russia Iron.—Nos. 9, 10, 11 and 12, ₩ lb....22c
No. 1, stained, ₩ lb....22c
Imitation Russia, ₩ lb....12c

CHICAGO.

(Reported by Cragin Bros. & Co., 141, 143, and 145 Lake St.)

Tin Plate.—

IC, 20x14, Coke....	$13 00	IXX, 14x20, Charcoal..	21 00
IC, 10x14, Charcoal.	14 00	IXXX, 14x20, "	24 00
IX, 10x14, "	17 00	IXXXX, 14x20, "	27 00
IC, 12x12, "	14 50	IX, 14x14, "	38 50
IX, 12x12, "	17 50	DC, 100 Plate, "	14 00
IC, 14x20, "	15 00	DX "	17 00
IX, 14x20, "	18 00	DXX "	20 00
IC, 14x20, Coke Roofing....		DXXX, "	23 00
IC, 10x20 Coke, for Gutters....			21 00
IC, 14x20, Charcoal Roofing....			13 50
IX, 14x20, "			15 50
IC, 20x28, "			27 50
IX, 20x28, "			32 50

Pig Tin.—
Large, 60 lb....42c
Small, 30 lb....43c
Bar Tin....44c

Zinc.—
In casks 1000 ₩ s....11 c
" 500 " 11½c
In sheets....11½c
Slab....9c

Copper.—Copper Bottoms....40c
Sheathing Copper....38c
Planished Copper, 14x48....46c
Size, 14x52, 14x56, 14x60; Nos. 7 8 9 } Planished Copper....48c
Braziers' Sheets, 30x60.—6 to 8 lbs....46c
10 and 12 lbs.... " 43c
15 to 100 lbs....40c
Ingot Copper....
Bolt " 45c

Solder.—Extra Fine, C. B. & Co.'s Brand....25c
Fine, No. 1....22c
Ordinary, No. 2....21c
Plumbers' Solder....23c
Braz'ra' or Spelt'r Solder 35c

Antimony....20c
Babbit Metal....15c @ 25c.
Galvanized Iron Conductor Pipe....₩ lb 10c

Sheet Iron.—

	Common.	Smooth.	Charcoal.
No. 14 to 24....	6¼c	7¼c	8¾c
25 & 26....	6¼c	7¾c	9 c
27....	6¼c	7¾c	9¼c

Add ½c ₩ lb for 30 in. wide.

Galvanized Iron....dis 25 %

No. 16 to 20....	15c	No. 24....	18c
21 to 24....	16c	28....	20c
25 & 26....	17c		

Russia Iron.—
Perfect, 8, 9 and 10.... 22c
" 11 and 12.... 22c
No. 13.... c
In Sheets, 1c. higher.

American Russia.—
A.... 15c
B.... 13c
In sheets, 1c higher.

Lead.—
Pig.... 8½c
Bar.... 10c
Lead Pipe, in full coils 10½c
Lead Pipe, when cut, 11½c
Sheet Lead.... 10½c

DETROIT.

(Reported by Messrs. Jewett & Root.)

Tin Plate.—Best Charcoal
IC, 10x14....$13 25
IX, 10x14.... 16 00
XX, 10x14.... 18 75
IC, 12x12.... 13 75
IX, 12x12.... 16 50
IC, 14x20.... 14 25
IX, 14x20.... 17 00
XX, 14x20.... 19 75
XXX, 14x20.... 22 50
XXXX, 14x20.... 25 25
DC, 100 Plate.... 12 75
DX, " 15 50
DXX, " 18 25
DXXX " 21 00
DXXXX 100 Plate .. 23 75
IX, 14x14.... 24 75
IC, 10x14 W.... 12 75
IX, 10x14 W.... 15 50
Roofing Tin.—Best Char. IC Terne, 14x20....$12 15
IX, " 14x20.... 14 90
IC, Terne, 20x28.... 25 75
IX, " 20x28.... 28 50
Coke Tin.—
IC, 10x14 Coke....$11 25
IX, 10x14, Coke 13 00
IC, 14x20, " 13 25
Sheet Zinc.—Any width....10¾c

Copper.—
Sheathing....37½c
Copper Bottoms....39½c
Planished Copper.—
Sheathing, 14x48....46c
Boiler Size, No. 7....48c
" " No. 8....48c
" " No. 9....48c
Pig Tin.—
Large Pigs....39c
Small Pigs....40c
Bars....41c
Solder.—No. 1....21½c
No. 2....19½c
Bright Wire...dis 27½ %
Sheet Iron.—
No. 18 Am. Com....6
No. 24 Am. Com....6
Pat. Am. Russia "A,"
Nos. 24, 25 & 26....14c
Russia No. 9, 10, 11 & 12. 21½c
W. D. WOOD'S & CO.'S SHEET IRON.—
Nos. 15 to 20 Smooth $7 15
" 21 to 24.... 7 35
" 25 & 26.... 7 55
" 21 to 24 Char'l.. 8 85
" 25 & 26 " .. 9 05

Sheet Zinc.—Any width....10¾c

CINCINNATI.

Reported by Sellew & Co., Importers and Jobbers Metals, No. 214, 216 and 218 Main street.

Tin Plate.—I. C. 10x14 Charcoal....$14·00 @ $15·00
I. C. 10x14 best Coke.... 13·00 @ 14·00
I. C. Terne, 14-20.... 12·50 @ 13·75
I. C. " 20-28.... 26·00 @ 28·00
I. C. Continuous.... 28·00
Pig Tin.—
Banca....₩ lb 47c
Straits....lb ₩ 42c
English....42c @ 43c
Solder.—
S. & Co....₩ lb 28c
A I....₩ lb 25c
Roofing.... " 24c
Lead.—Pig..₩ lb 7½c @ 8c. | Bar....₩ lb 8c @ 9c
Copper.—
Ingot....₩ lb 31c @ 33c
Planished.... " 51c @ 53c
Sheathing.. " 44c @ 46c
Bolt.... " 40c
Brazier, 6 to 9 lb...₩ lb 46c
" 10 to 14 oz... " 43c
" 14 to 100 lb.. " 40c
Copper Bottoms.. " 45c
Zinc.—Cask, 500 to 1000 lbs....₩ lb 11½c
Case, 100 lbs.... " 11¾c
Slab.... " 8½c @ 9c
Brass.—
Roll, No. 6 to 30. ₩ lb 45c
" 30 to 38. " 65c
Roll, No. 38 to 40... ₩ lb 50c
Wire, No. 0 to 20... ₩ lb 50c
" 20 to 25.. " 60c
Babbit Metal.—
Sellew & Co....₩ lb 35c
Black Lead....₩ lb 25c
Market.... " 15c
Antimony....₩ lb 22c
Bismuth....₩ lb $6 00
Nickel....₩ lb $3 5
Sheet Iron.—
Russia....₩ lb 20c @ 22c
Am Russia A..₩ lb 14 @ 15c
" " B. " 13 @ 14c

	Com. B.	Smooth Fin. S.	L. U.	D Re'fd.
15 to 20....	6·0c	7·5c		9·0c
22 to 24....	6·2c	7·8c		9·2c
26....	6·4c	8·0c		9·4c
27....	6·6c	8·2c		9·6c

Galvanized Iron.—Full bundles....dis 20 %

Nos. 18 to 20....	15c	No. 24....	18c
22 to 24....	16c	28....	20c
25 to 26....	17c		

Bar Steel.—Silver, ₩ lb 21c; Crescent, 17½c.
Iron Wire....dis 15 %
Enameled Ware....dis 33⅓ %
One Piece Corrugated Elbows.—

Charcoal Iron.		Russia Iron.	
4½ inch....	₩ doz $3·75	4½ inch....	₩ doz $8·00
5 "	4·25	5 "	10·00
5½ "	5·25	5½ "	13·00
6 "	5·25	6 "	13·00
7 "	6·50	7 "	14·00

Leader Elbows—Flat Crimp Retinued.—

	₩ doz.		₩ doz.
2-inch....	$2 00	2½-inch....	$2 25
3-inch....	2 50	3½-inch....	3 00
4-inch....	3 50	4½-inch....	4 00

Sheet Iron Bread Pans....₩ lb 18c
American Broilers....₩ doz, $13·50
Tinmen's Machines....Net list
Sad Irons....₩ lb, 5½c
Brass Kettles.—Ansonia....48c

London Metal Market.

(From The Mining Journal.)

	£.	s.	d.	£.	s.	d.
Copper—₩ ton.						
Best Selected....	90	0	0	92	0	0
Tough Cake & Tile....	88	0	0	91	0	0
Sheathing and Sheets....	97	0	0	100	0	0
Bolts....	98	0	0	100	0	0
Bottoms....	98	0	0	100	0	0
Old (Exchange)....	80	0	0	—	—	—
Burra Burra....	90	10	0	91	0	0
Wire.... ₩ lb.	0	1	1¼	—	—	—
Tubes.... "	0	1	0½	0	1	1
Brass—₩ lb.						
Sheets....	0	0	10	0	0	10¾
Wire....	0	0	10¾	—	—	—
Tubes....	0	0	11¾	0	0	11¾
Yellow Metal Sheathing....	0	0	8¾	0	0	9
Sheets....	0	0	8½	—	—	—
Tin—₩ ton.						
English Blocks....	129	0	0	131	0	0
Ditto Bars....	130	0	0	132	0	0
Ditto Refined....	132	0	0	133	0	0
Banca....	132	0	0	—	—	—
Straits....	129	10	0	130	0	0
*Tin Plates—† ₩ box.						
IC Charcoal.... 1 qual.	2	0	0	2	3	0
IX " .... 1 qual.	2	6	0	2	9	0
IC " .... 2 qual.	1	18	0	2	0	0
IX " .... 2 qual.	2	3	0	2	5	0
IC Coke....	1	12	0	1	16	0
IX "	1	18	0	2	2	0
Canada Plates....₩ ton.	21	0	0	22	10	0
" at works....	22	0	0	22	10	0
Spelter—₩ ton.						
Foreign....	36	10	0	—	—	—
To arrive....		—			—	
Zinc—₩ ton.						
In Sheets....	32	0	0	32	0	0
Iron—₩ ton.						
Bars Welsh, in London....	12	2	6	12	5	0
" to arrive....	12	0	0	—	—	—
Nail Rods	12	10	0

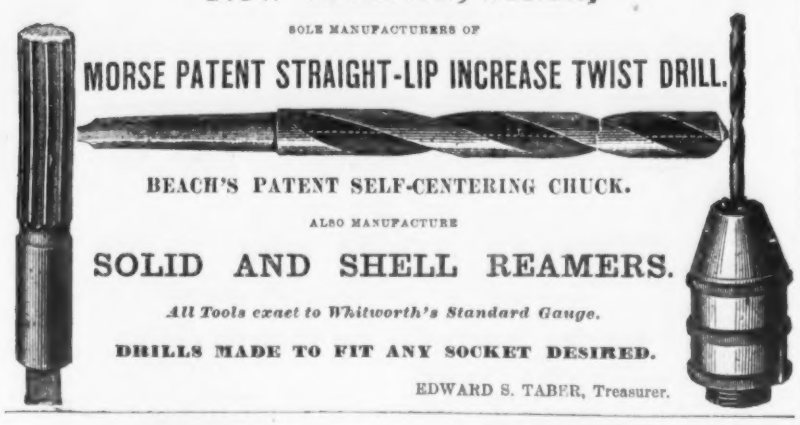
Machinery, &c.

Morse Twist Drill and Machine Company,

New Bedford, Mass.,

SOLE MANUFACTURERS OF

MORSE PATENT STRAIGHT-LIP INCREASE TWIST DRILL.



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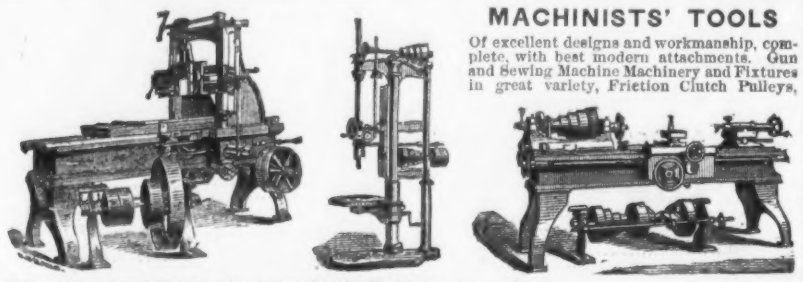

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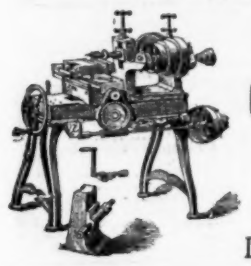

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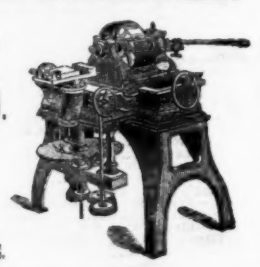

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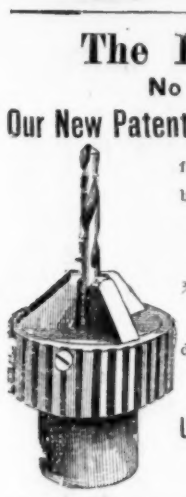
No 82 Chambers St., N. Y., Manufacturers of

Our New Patent Improved Self-Tightening Drill Chuck, Victor No. 3.



The cut at the right shows the extra set of jaws which we furnish when ordered, at $2·00.
They can be used for chucking small articles for turning, boring, &c., from 0 to 1⅝.
The jaws can be changed in three minutes.

The best Chuck in the Market!

☞ All its parts are of Cast Steel. Warranted to hold ⅛ to 0 drills with the clasp of the hand.

Price - - - - - - $8·00.
Extra Jaws - - - - - 2·00.

No. 4 VICTOR CHUCK, same principle as No. 3, will hold drills from ¾ shank down to ⅛ inch.

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Extra Jaws - - - - - 2·50.

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UNIVERSAL DRILL CHUCKS, No. 1 and 2,

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It is more Easily Worked, gives a Better Blast, at the Cheapest forge made, and

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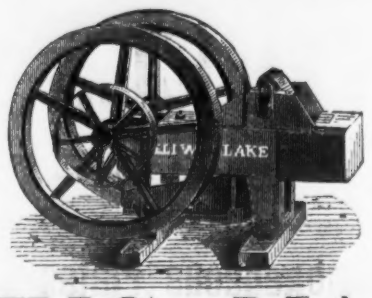

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for reducing to fragments (of any required size) all kinds of

Hard and Brittle Substances, such as

ROCKS, ORES, MINERALS AND DRUGS.

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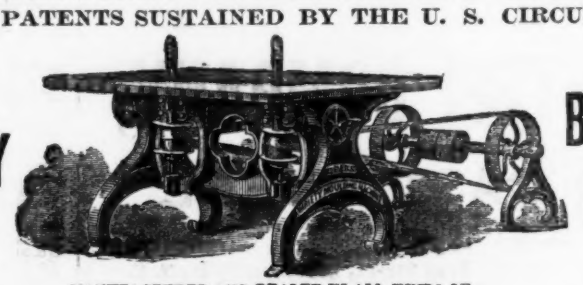

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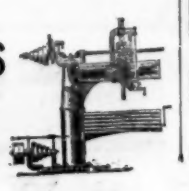

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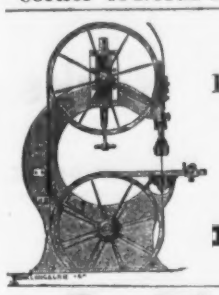

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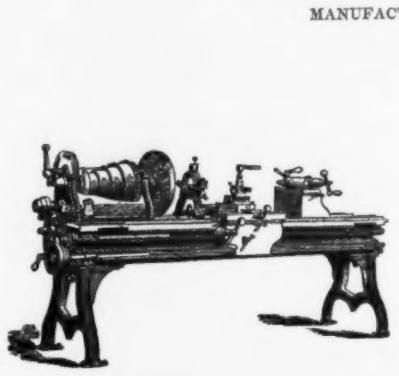

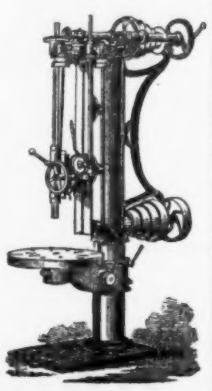

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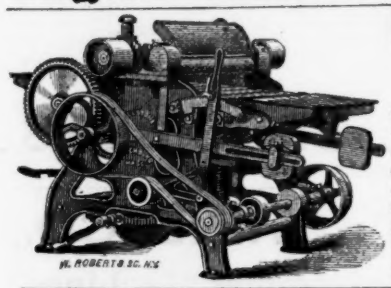

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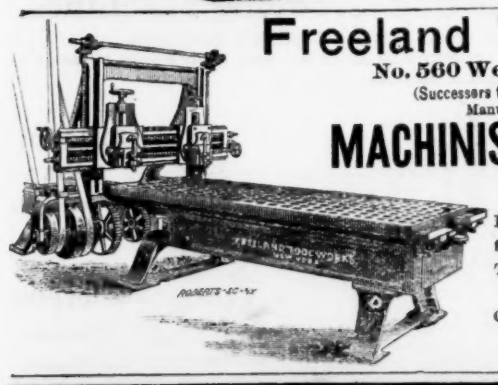

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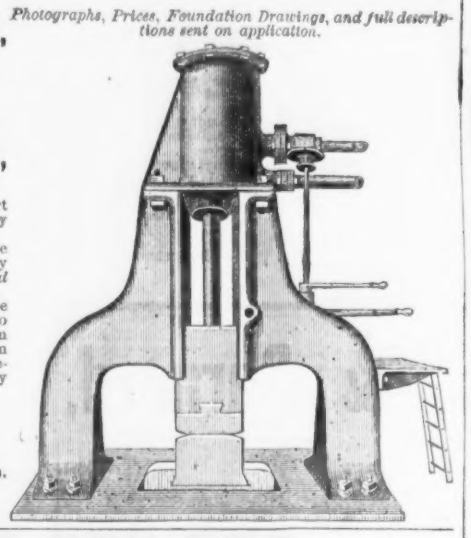

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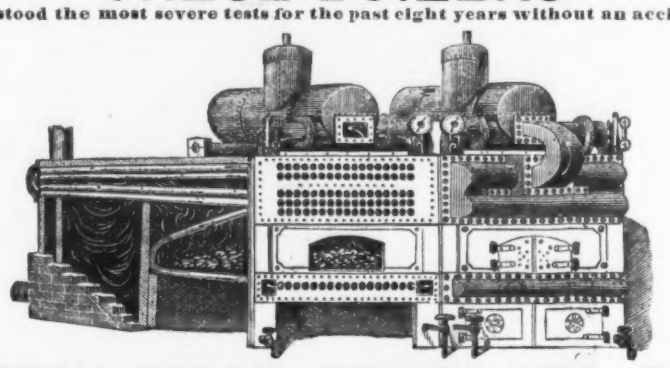

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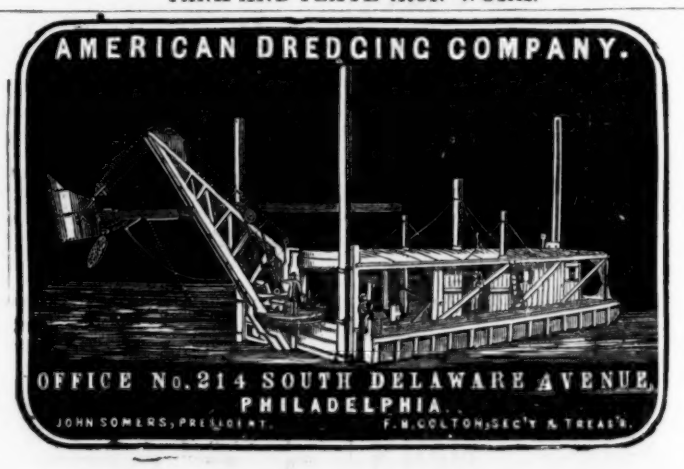
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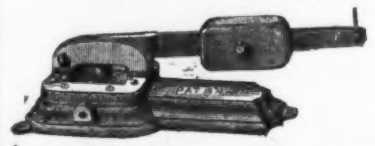

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It is entirely free from acids; for efficiency it is the cheapest invented. *Price, 25 cents a pound.* Parties trying this compound and finding it other than represented are freed from any cost. All I ask is a fair trial, and insure satisfaction. I will send to any party as many pounds as they need for trial, and ask payment only after they are satisfied. 1-3 of a pound for each horse power for first trial; after, 1-8 of a pound every two weeks. Send for Circulars.

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Steam Engines and Boilers,
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" " " .....40 cts. ℔ lb
R " " " .....35 cts. ℔ lb
C " " " .....30 cts. ℔ lb

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PATENT

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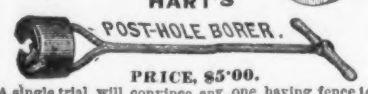

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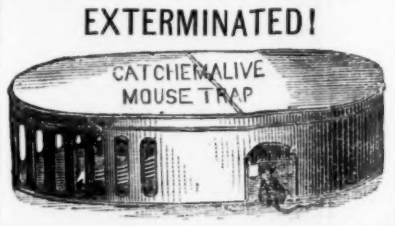

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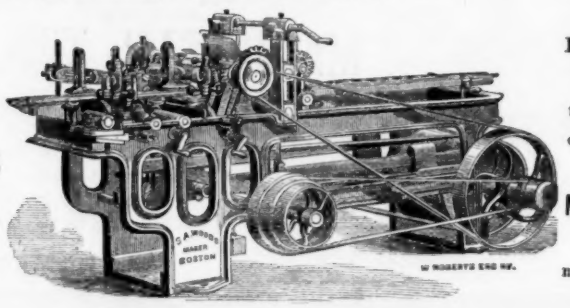

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